Risk factors for overweight and obesity among urban women aged 30 to 40years, Vellore, Tamilnadu

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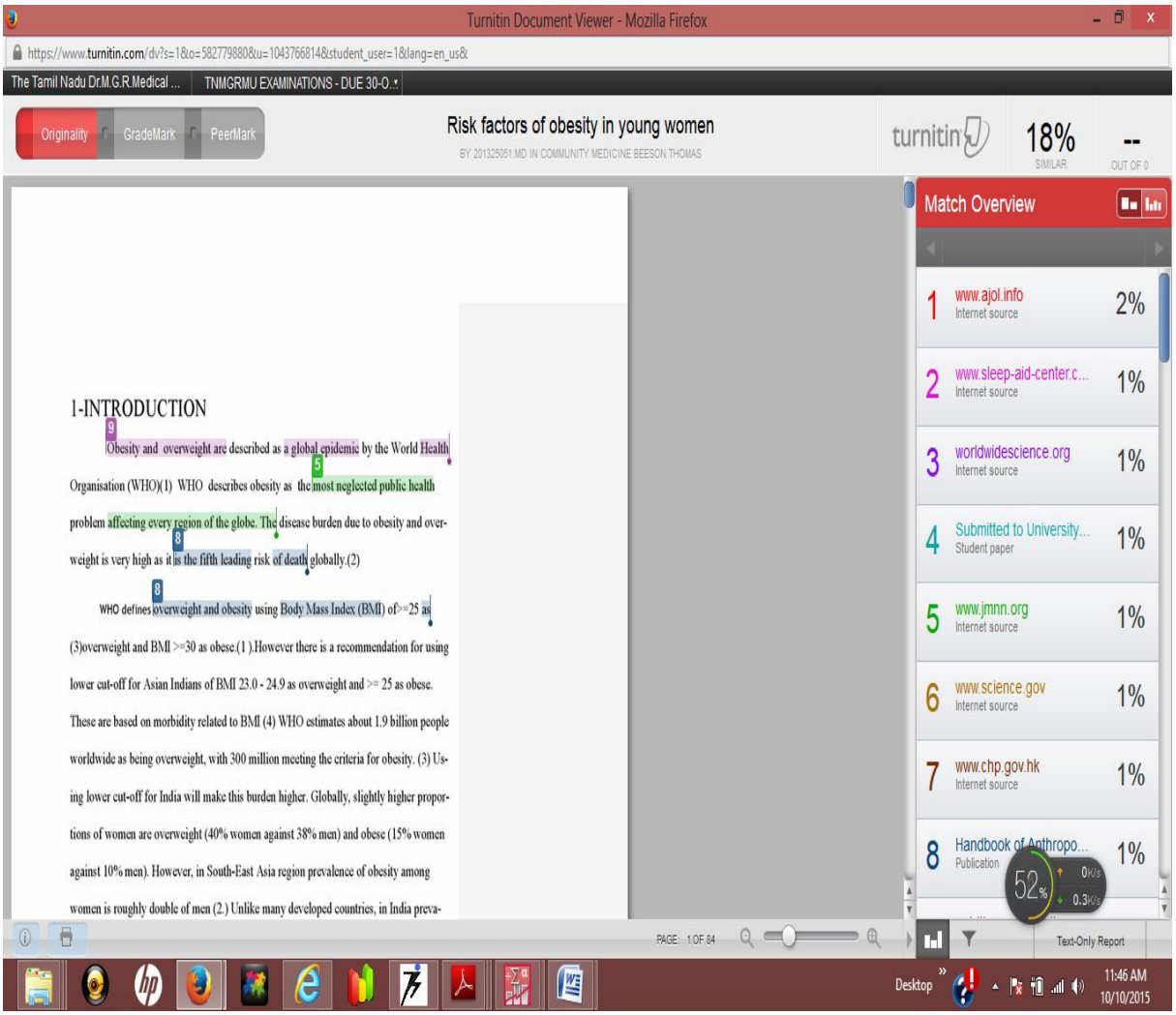
Originality certificate



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.

Acronyms

BMI- BODY MASS INDEX
CAD- CORONARY ARTERY DISEASE
CHD- CORONARY HEART DISEASE
CMD- COMMON MENTAL DISORDER
GHQ- GENERAL HEALTH QUESTIONNAIRE
GPAQ_GENERAL PHYSICAL ACTIVITYQUESTIONNAIRE
ICMR- INDIAN COUNCIL OF MEDICAL RESEARCH
IPAQ- INTERNATIONAL PHYSICAL ACTIVITY QUESTIONNAIRE
IPAQ-SF INTERNATIONAL PHYSICAL ACTIVITY QUESTIONNAIRE- SHORT FORM
JHW- JAIPUR HEART WATCH STUDY
LSCS- LOWER SEGMENT CAESAREAN SECTION
NFHS- NATIONAL FAMILY HEALTH SURVEY
OR-ODDS RATIO
PA-PHYSICAL ACTIVITY
SES- SOCIO-ECONOMIC STATUS
WHO- WORLD HEALTH ORGANSATION
WHR- WAIST HIP RATIO

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ABSTRACT

TITLE OF THE STUDY:. Risk factors for overweight and obesity among urban women aged 30 to 40years, Vellore,Tamilnadu.

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Background:

Overweight and obesity are increasing all over the world and women in India are affected more than men. Risk factors for obesity among young women need to be identified so that the epidemic can be halted.

Objectives:

1) To study the association of socioeconomic status with overweight (BMI >= 25 kg/m^2) among urban women aged 30 to 40 years in Vellore.

2) To study the association of other risk factors such as diet, activity and obstetric factors with overweight status among urban women aged 30 to 40 years.

Methods:

The study was an unmatched case-control study in Vellore Corporation. Cases and controls were obtained by simple random sampling from a list of individuals examined during a cross sectional study on risk factors for coronary heart disease in 2012.Cases were

be taken as women with current BMI >= 25 kg/m2 while controls were women with BMI < 25 kg/$m^{2..}$ A questionnaire which assessed socio-demographic factors, exercise, depression, diet and reproductive factors were administered by the investigator. Unadjusted and adjusted odds ratios were calculated between overweight/obesity and risk factors.

Results with conclusions:

The number of cases studied was 112 (BMI >= 25 kg/m^2) and 58 were controls (BMI < 25 kg/m^2). The unadjusted odds ratio of developing obesity or overweight among women who belonged to the upper/upper middle class (modified Kuppusamy scale) was 2.74 times higher than women who belonged to other lower socioeconomic classes (95% CI :1.09-7.63).

After adjusting with age and SES, Parity <=2,(p value .004,adjusted OR- 4.99 CI: 1.68-14.83) intake of more than recommended protein (p value .002, OR-3.67 CI:(1.604-8.39), and history of hyperlipidemia (p value-.023,adjusted OR-3.95.CI:1.2-12.902) were found to be statistically associated with overweight .

This study brings out the importance of public health action against obesity which will further lead to many metabolic complication that can be prevented. Housewives are important group in family and society, has to be screened educated and treated for obesity and its related problems.

Key words: overweight, obesity, urban women, Vellore, risk factors

1. INTRODUCTION

Obesity and overweight are described as a global epidemic by the World Health Organization (WHO)(1)WHO describes obesity as the most neglected public health problem affecting every region of the globe. The disease burden due to obesity and overweight is very high and is the fifth leading risk of death globally.(2)

WHO defines overweight and obesity using Body Mass Index (BMI) of>=25 as (3)overweight and BMI >=30 as obese.(1).However there is a recommendation for using lower cut-off for Asian Indians of BMI 23.0 - 24.9 as overweight and >= 25 as obese. These are based on morbidity related to BMI(4). WHO estimates about 1.9 billion people worldwide as being overweight, with 300 million meeting the criteria for obesity. (3) Globally, slightly higher proportions of women are overweight (40% women against 38% men) and obese (15% women against 10% men). However, in South-East Asia region prevalence of obesity among women is roughly double of men (2.) Unlike many developed countries, in India prevalence of obesity is higher in urban population and in urban slums it is rising (5)

Modern life has changed the way people eat. More money for food has resulted in better tasting but high caloric food. Advanced technology has made life easier but made people less active. According to cellular basis for obesity adipocytes may increased in number or size in an obese persons. Obesity happens when energy output is greater than energy input. The energy equilibrium can be affected by many factors such as metabolic,

genetic ,exercise, sex, age, socioeconomic status, endocrine, smoking, diet, pregnancy and physiological changes(6)

Obesity is also associated with high morbidity. Diseases like hypertension, diabetes, infertility, dyslipidemia, depression and ischemic heart diseases are some. Some studies have found that an obese woman has 3.8 fold increased risk of dyslipidemia compared to their healthy weight counterparts.(6,7)

Combating obesity is of great public health concern for the future social well-being of populations. High prevalence and the consequences of obesity have made it an easy business, deceiving the public by advertisements of medicines, instruments, belts, special exercises etc to reduce obesity. People are not aware of ideal diet, exercise suitable for them and appropriate treatment for the related health conditions. They also need to know factors predisposing to obesity and preventive measures. Health communication with behaviour change remains the best for achieving this.

In order to adequately deal with the problem of obesity, it is very important to understand risks factors of obesity in the social, economic and cultural context. This study proposes to evaluate the relationship of social, environmental, dietary and other life-style factors with obesity in young women between age group of 30-40 in urban Vellore.

1.2 JUSTIFICATION

Overweight and obesity are significant public health problem that are associated with many chronic health conditions and with higher premature mortality. WHO 2014 estimates identify 39% of overweight and additional 13% obese adults in this group (2). In South-Asia region women have roughly double the obesity prevalence of men (4), making it an important study for gender and health.

Unlike the developed countries, the prevalence of overweight and obesity in developing countries such as India is higher in urban population. A major concern in India is the rapid urbanisation (30% population) ((7) Changing economy and livelihood options are driving urbanisation which is also increasing in the slums in India. Transiting from rural to urban changes the whole lifestyle to a more sedentary type with marked change in diet. This is probably the reason for a rising prevalence of obesity among the urban slum population ((8))

A Chennai urban slum study has shown the prevalence of overweight/obesity was highest (42.7%) in the age group between 30-39 years.(8) Another ICMR study (9) in urban and rural Vellore {unpublished, in press}has shown that prevalence of Body mass Index $\geq$25 kg/m^2in urban women in the age group of 30-40 to be 55.8% while in rural women with same age group it was 41.2%. Both studies have identified high prevalence among younger women also. These women tend to be housewives (3/4) and are finan-

cially dependent on their husbands. The cause for concern is that persons who are overweight and obese tend to remain so through their life time (7). In terms of specific morbidity, the studies show that an obese woman has 3.8 fold increased risk of dyslipidemia compared to their healthy weight counterparts in future. (6)

This study being conducted among women in the age group of 30-40 is particularly relevant because they comprise 20% of population worldwide. They are also the backbone of a family responsible for health, nutrition and care giving. Their health determines the health and survival of the rest of the family and they are the key persons influencing

behaviours related to diet and lifestyle choices. Therefore, it is important to intervene and reduce the burden of overweight and obesity when they are younger and tackle causes at the earliest. There are many risk factors known to cause obesity such as diet, physical activity, and family history of obesity, mental health, socio-economic factors and obstetrical factors. There are studies done on prevalence of obesity in women but there are not many community based studies on the risk factors of overweight and obesity particularly in women in India.

This study will explore various risk factors of obesity and overweight in young urban women.

2. OBJECTIVES

1) To study the association of socioeconomic status with overweight and obesity among urban women aged 30 to 40 years in Vellore town.

2) To study the association of risk factors such as diet, activity and obstetric factors with overweight and obesity among urban women

Hypothesis: Urban women belonging to higher socio economic (SES) groups will have higher risk of developing obesity as compared to others who are of a lower SES.

3. LITERATURE REVIEW:

3.1 Obesity –a lifestyle disease

Globalization has brought a lot of changes in food habits because of availability, improved purchasing power and accessibility of fast foods even in rural areas. Data from National Nutrition Monitoring Bureau (NNMB) surveys showed increase in obesity in last two decades (10)Though a good proportion of Indian people are below poverty line, there has been a definite improvement in economic status of people above the poverty line. This has made more money available for food which coupled with the availability of energy rich food items is resulting in increased energy consumption. (10) India is currently facing the double burden of under nutrition and increasing obesity.(11)

With increasing access to piped water supply, cooking gas, transport, modern technologies and electricity have been useful as well as reduces labour. So there has been substantial reduction in physical activity pattern among high SES people. (10)

3.2 Economic cost of obesity

The annual cost of treatment for obesity in the United States alone is approximately $190.2 billion per year, or 20.6% of national health expenditures .(12). An obese person

incurs $2741 more in medical costs annually compared with a non-obese person. The annual cost of lost productivity due to obesity is around $73.1 billion, (13)and people spent almost $121 billion annually on weight-loss services and products. In addition to the direct costs of obesity in terms of the individual's ill health and weight management, there are costs due to reduced quality of life (intangible costs), and societal costs in terms of loss of productivity due to sick-leave and premature pensions (indirect costs).(13)The indirect cost can extend to poor employability.

Recent studies from united states showed that percentage of people getting rejected due to obesity alone was 18% in army recruitment .(14)This is serious since the National centre for health statistics reported that 23% of young adults were obese(15)

3.3Definition of overweight and obesity:

WHO defines obesity as the "abnormal or excessive fat accumulation that presents a risk to health."(16).However, it is generally understood as a measure of the Body Mass Index (BMI). According to WHO guidelines a person with BMI >= 25 is considered overweight and a BMI of >=30 is considered to be obese. The recommended Indian cut off are lower with BMI of 23.0 to 24.9 defined as overweight and >= 25 as obese. (4)

3.4 Assessment of nutritional status in adults

BMI provides a simple and convenient measurement of nutritional status based on which an individual can be classified into under nourished, normal, overweight and obese. Since

the body fat plays an important role in making a person obese, measurement of body fat gives more detailed and specific information. Regional distribution of excess body fat is linked to the morbidity and mortality associated with obesity. Excessive abdominal fat ('central obesity') has the highest risk. (17) Populations (e.g. Asian) who tend to have relatively low BMIs but with excessive abdominal fat are prone to diabetes, coronary heart disease (CHD) and hypertension.(17) A Study done by Gopalan et al showed that almost 20% of adults who neither overweight nor obese had central obesity and were at higher risk of developing the associated diseases.(17). Most widely used criteria are for measurement of body fat are the following-

1) Waist circumference and waist-hip ratio (WHR)

Waist circumference and waist-hip ratio (WHR) are the approximate indices of intra abdominal fat mass and total body fat. A woman with a waist circumference >=88cm has increased risk of metabolic complication. It has been widely accepted that WHR more than 0.85 in women indicates abdominal fat accumulation.(18)

2) Skin fold thickness.

A large proportion of fat is located just under the skin. It is most accessible site for measurement, can be done rapidly and is a non invasive tool for assessing body fat. The measurement should be taken at four sites - suprailiac,biceps,midtriceps and subscapular. The total of all four sites should be less than 50 mm for a normal person. (19)

3) **Indicators to assess extra fat**

Ponderal index,Brocca index,Lorentz formula and corpulence index are used to assess obesity.(20).BMI and Broccas index are more widely used for prevalence of obesity in a community(12).Other indicators like measurement of total body water and total body potassium are relatively complex and not used in routine studies(21)

3.5 Classification of nutritional status using Body Mass Index:

There is an internationally accepted classification of nutritional status which differentiates between multiple classes of obesity. Many national and international groups have debated the use of international classification on racially different populations. WHO expert group recommends different guidelines for Asia Pacific region based on available evidence. The different cut off for classification into overweight and obese is lower for populations in Asia Pacific region is given in table 3.1. These cut off are recommended because better predict the relationship to body fat and risk of morbidity and mortality.(4)

Table 3:1 Showing comparison of WHO International and Asia Pacific classification (1,4)

Category	International	Asia Pacific
Obese class 3	>=40	>25
Obese class 2	35-39.99	
Obese class 1	30-34.99	
Overweight	25-29.99	23-24.99
Normal	18.50-24.99	18.50-22.99
Underweight	<=18.49	<=18.49

3.6AETIOLOGY

3.6.1 The Energy Imbalance

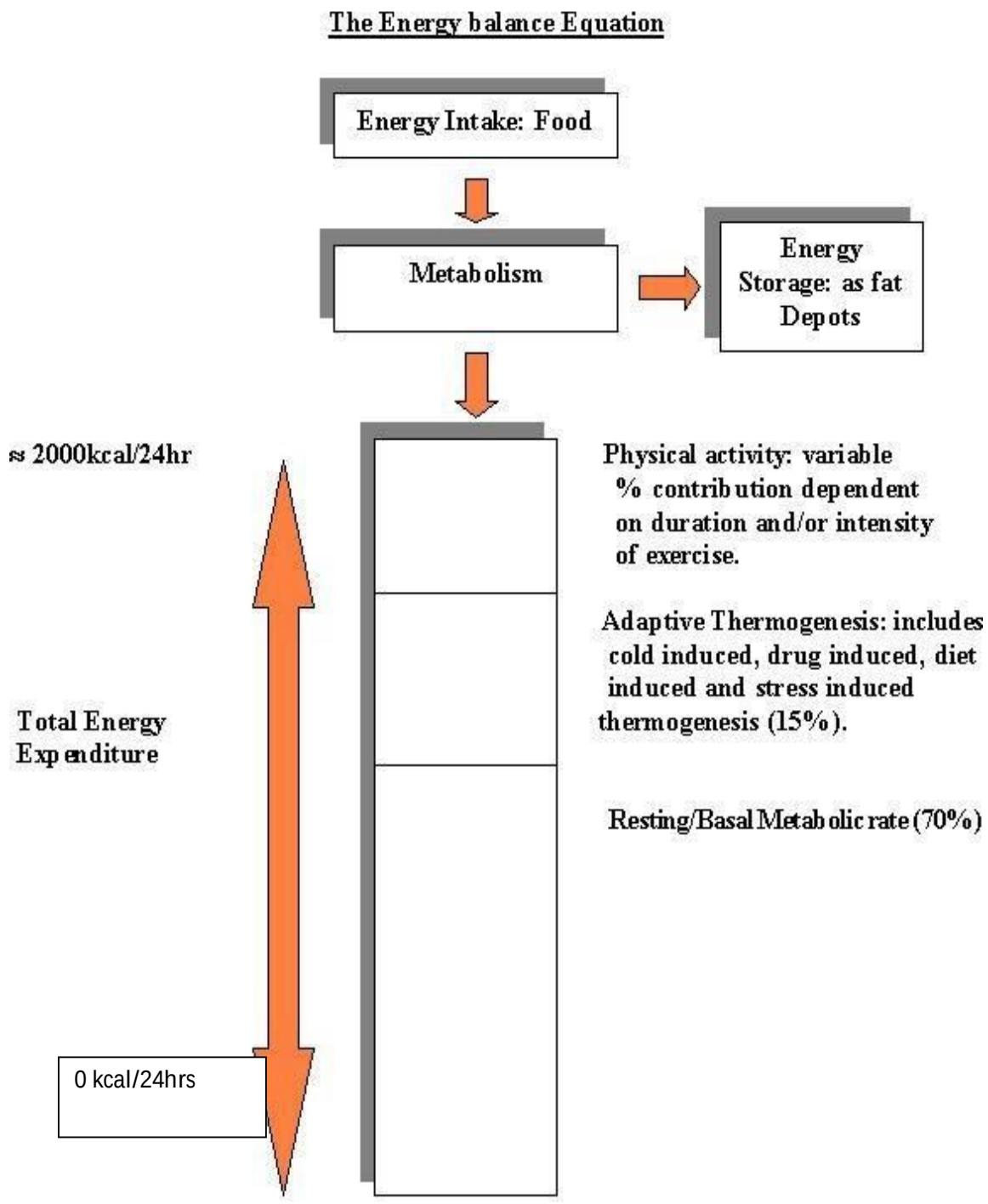
The etiology of obesity is far more complex than simply an imbalance between energy intake and output although this concept allows easy understanding of the various mechanisms involved in development of obesity.

This mechanism is presented in figure 1.1 (22)on next page

Other Possible factors in the development of obesity (22)include the following:

- Genetic, Metabolic and endocrine factors
- Race, sex, and age factors
- Socioeconomic status and cultural factors
- Dietary habits and physical activity
- Smoking cessation
- Psychological factors
- Pregnancy (history of gestational diabetes) and menopause
- Lactation history in mothers

Figure 1.1


The Energy balance Equation
Energy Intake: Food
Metabolism
Energy Storage: as fat Depots
≈ 2000kcal/24hr
Physical activity: variable % contribution dependent on duration and/or intensity of exercise.
Adaptive Thermogenesis: includes cold induced, drug induced, diet induced and stress induced thermogenesis (15%).
Resting/Basal Metabolic rate (70%)
Total Energy Expenditure
0 kcal/24hrs

3.6.2 Pathophysiology of obesity:

Hypertrophic versus hypercellular obesity

According to cellular basis for obesity, adipocytes maybe increased in size or number in obese people. Android abdominal obesity is an example of hypertrophic obesity caused by enlarged fat cells. Hypercellular obesity is more variable than hypertrophic obesity. Hypercelular obesity occurs commonly in childhood or adolescence obesity, but it is also found in severely obese persons.(22, 23)

Hypertrophic obesity usually starts in adulthood. This type is associated with increased cardiovascular risk and other metabolic complications. Hypertrophic obesity responds quickly to weight reduction measures like physical activity whereas hypercellular obesity does not respond to nonsurgical interventions.(22, 23)

3.6.3 Epidemiology:

Obesity can be called the first wave of a defined cluster of noncommunicable diseases called "New World Syndrome.(24)It has created an enormous socioeconomic and public health burden in poorer countries. (24)Obesity and overweight are 5^{th} leading risk of global death.

According to National family Health Survey-3(NFHS-3) in India, overweight and obesity are three times higher in urban areas than in rural areas and more common among women. (15) There is also a rising prevalence of obesity among the slum population.(25)In an urban slum of Chennai the prevalence of overweight/obesity was highest (42.7%) in the age group between 30-39 years.(26)An ICMR study conducted to measure prevalence of risk factors for non-communicable diseases in residents of urban and rural areas of Vellore in 2012{unpublished, in press}(9)has shown that prevalence of Body mass Index ≥25 kg/m2in urban women in the age group of 30-40 was 55.8% while in rural women of same age group it was 41.2%.Another multi centric cross sectional study in 2000 involving seven urban cities in India (Chennai, Bangalore, Hyderabad, Mumbai, Culcutta and New Delhi) showed prevalence of obesity was 31% in 20-40 years of age group (sample size: 5288 men; 5928 women).(27)

The Jaipur Heart Watch (JHW) was a combination of many cross-sectional epidemiologic studies. This study was conducted in India in multiple rural and urban locations covering both men and women aged 20-59 years . Age-adjusted prevalence (%) of obesity in various cohorts of rural JHW, urban JHW-1, urban JHW-2, urban JHW-3 and JHW-4 respectively were 8.9, 15.7, 45.1, 61.5, and 57.7(r^2 =0.88, P=0.018) among women and 9.4, 21.1, 35.6, 54.0, and 50.9 (r^2 =0.92, P=0.009) among men. (28)

NFHS 3 reports that percentage of overweight or obese women is highest in Punjab (30%) followed by Kerala (28%) and Delhi (26%).(15)A cross sectional study done in rural areas of Trivandrum, Kerala showed 24% overweight and 40.7% obesity

in women.(29) In contrast, a cross sectional study done by Pradeep et al inurban Calicut, Kerala showed prevalence of overweight and obesity in women as 17% and 6.45% respectively. The same study reported 38.26% women with central obesity.(30)

Trends in Prevalence of obesity:

Gupta R from Jaipur carried out three epidemiological studies in the years 1994,2001 and 2003. These studies showed rising trend in obesity with prevalence of 20%, 36%, and 62% respectively.(28) Similar findings were reported from studies done in urban Chennai showing increasing prevalence of overweight/obesity at 23% in the year 1995 , 30% in 2000 and 42% in 2012.(26,27)

Age-wise distribution of prevalence was lacking in most studies. There were significant heterogeneity among studies mostly due to the varying time periods of data collection and differing definitions of obesity. However, prevalence of overweight/obesity classification was based on WHO definition of overweight and obesity.

3.7 Risk Factors for Obesity and Overweight

3.7.1 Age:

Obesity can occur any age and incidence of obesity increases with Age. Misra et al showed an increasing trend with advancing age the study done in north India (chi-square for trends=14.1, $P<0.001$). (5)About 33% of obese adults have been so since childhood.(31)Pradeep et al, Anuradha et al and many other studies have also demonstrated significant increase in obesity with advancing age.(9,17,26.28-30)Body fat increases with ageand as people grow older their basal metabolic rate falls and energy expenditure decreases. If caloric intake remains constant or increases the older peoplewill gain weight. (6)

3.7.2 Sex:

Generally women have higher rates of obesity as compared to men.(32) In 2014 WHO estimates 38% of men and 40% of women had BMI ≥25 kg/m2 and 11% of men and 15% of women had BMI ≥30 kg/m2. (2)In South-East Asia Regions, obesity among women is roughly double of men.(2) A study done by A Misra et al(5) confirmed that

obesity is more prevalent in women (15.6%; 95% CI 10.7-22.3) as compared to men (13.3%; 95% CI 8.5-19.5) Men have a higher resting metabolic rate than women and so they require more calories to maintain body-weight. In postmenopausal women, decreased metabolic rate and alterations in ovarian hormones accelerate the age-related increase in obesity and decrease energy expenditure. This explains why more women are obese especially after the age of 50 years.(33)

3.7.3 Genetic factors

It has been proved that 30–70% of the variance in BMI in humans can be explained by genetic factors.(34) More than 300 genes, chromosomal regions and markers

have been found to be associated with obesity phenotypes.(35) The discovery of the leptin gene has explained the role adipose tissue plays in the regulation of energy balance and appetite.(36).Leptin acts within the arcuate nucleus of the hypothalamus. It decreases the expression of orexigenic signals and increases anorexigenic signals, thus reducing appetite and food intake.(37)These genemutation mechanisms explain only a very small proportion of cases of obesity.

The common form of obesity is a polygenic disease. It has been very difficult to unravel the genetic aetiology of human obesity. However, scientists are trying to uncover a number of new gene loci through whole genome analyses that may cause increased adipose tissue deposition. Association to the polygenic form of obesity lies close to the FTO (fat

mass and obesity associated) gene has been confirmed in a number of large population studies.(38)

3.7.4 Education and literacy:

The level of education is inversely associated with obesity particularly in women. (39,40)A national obesity survey in South Africa demonstrated that women with greater than 12 years of education had higher BMIs than women with lesser than 12 education($p < 0.0001$) by multivariate regression analysis. Women in the latter group tend to perform manual labour more than the educated women. This may explain inverse association of obesity and education. Similar finding was shown in a study done in Chennai, South India with overweight/obesity among 42.2% of women with a higher secondary level or higher education as compared to 29.3% illiterate women.(26)

However several other studies by Spasojevic (2003), Arendt (2005), Kenkel et al. (2006), Cutler and Llras-Muney (2006) and Sanchez-Vaznaugh et al. (2009) showed a strong education gradient in BMI or obesitywith the better educated, especiallywomen were less likely to be overweight or obese.(37)Following three factors explain the positive effect of education on obesity a)greater access to health related information and ability to use such information; b)clearer understanding of the risks associated with lifestyle choices c) improved self-control and preferences over time. The higher the individual's

education compared to his or her peers, the lower is the probability of the individual being obese. The latter effect may be because of different levels of perceived stress experienced by individuals and by different coping mechanisms.(41)

3.7.5 Socioeconomic status (SES)

SES is a complex, multidimensional concept and is typically represented using one or all of the "triad"of indicators; education, income and occupation. Beyond the many studies that use these three SES measures, socioeconomic status (SES) has long been known to affect health, with better SES being associated with benefits to health)(41,42).SES-based disparities have been shown across a range of health outcomes in adults, including obesity. Previous studies have shown that influence of SES on health begins early in life with lasting influences on their adult years (43)

Dinsa et al found positive association between SES and obesity for both men and women in low-income countries or in countries with low human development index (HDI). (43) Higher SES class and/or those with higher educational qualification tend to be more likely to be obese. However it was shown that, the association becomes mixed for men and mainly negative for women in middle-income countries or in countries with medium HDI.(43)Reviews of high-income country studies have shown that there an inverse association between SES and childhood obesity. It suggests that the shift of obe-

sity from the rich to the poor within countries may happen at a higher level of economic development .(44)

Mclaren, in his review “socioeconomic status and obesity “updated Sobal and Stunkard's exhaustive review of the literature on the relation between socioeconomic status (SES) and obesity.(45) The overall pattern of results, showed an increasing proportion of positive associations between SES and obesity as one moved from countries with high levels of socioeconomic development to countries with medium and low levels of development. This finding was irrespective of gender.

He has concluded this from 333 published studies. Findings varied by SES indicator. The negative associations (lower SES associated with obesity) for women in developed countries were most common with education and occupation as compared to positive associations for women in medium- and low-development countries were due to income and material possessions. This finding is interpreted in light of trends related to globalization.(45)

Obesity in the developing world can no longer be labeled a disease of groups with higher SES.(46) As the country's gross national product (GNP) increases the burden of obesity in each developing country tends to shift towards the groups with lower SES. The shift of obesity towards women with low SES occurs at a earlier stage of economic development than it does for men.(47)

Subramanian et al found in their study that the risk of over-nutrition at the individual level tended to be especially high in states with high income inequality. This finding was statistically significant after adjusting for various individual covariates as well as state economic development(Odds ratio -1.19 (95% CI 1.03 to 1.37).(46)

Although Sobel(39)and Mclaren from their extensive studies showed positive association with obesity and SES studies; the studies done in India showed that women who belongs to high SES group had higher risk of developing obesity as compared to women who belongs to low SES. Anuradha et al and Pradeep et al demonstrated that same findings in their study.(26,30)

3.7.6 Duration of sleep.

Physiologic studies suggest that less duration of sleep has metabolic effects that predispose to obesity. Patel et al demonstrated the association between self-reported sleep duration and subsequent weight gain by studying 68,183 women who reported their usual sleep duration in 1986 and were followed for 16 years. Multivariate analysis after adjusting for physical activity and dietary intake showed that women sleeping 5 hours or less gained 1.14 kg (95% confidence interval (CI): 0.49, 1.79) more than did those sleeping 7 hours over 16 years and women sleeping 6 hours gained 0.71 kg (95% CI: 0.41, 1.00) more.

The relative risk of a 15-kg weight gain was 1.12 (95% CI: 1.06, 1.19) for those sleeping less than 6 hours. The relative risks for incident obesity was 1.06 (95% CI: 1.01,

1.11). (48)Robert et al found that reduced amounts of sleep was associated with overweight and obese status.(49).An inverse relationship between short sleep duration and central obesity was found in women after adjusting for confounders in a study done by jenny et al.(50) Chaput et aldemonstrated that Short(5hours)and long-duration(>9hours) sleepers were 35% and 25% more likely to experience a 5-kg weight gain respectively, as compared with average-duration(6-8hours) sleepers in a prospective study done for 6 years.(51)

3.7.7 Diet:

There are strong cultural influences on the types of food consumed .There are communities abstaining from particular types of food. Method of cooking is also important. A high fat diet enriched with saturated fatty acids is common in high SES families and developed countries. In contrast, majority of people get their calories from a vegetarian diet in developing countries.(52, 53)

The calorie dense diet may predispose to obesity via elevated postprandial insulin levels. It leads to increased triglyceride storage in the adipose tissue depots. High insulin levels may activate a vicious metabolic cycle. Insulin induces hunger by decreasing the glucose levels of the blood. This promotes food intake which increases insulin secretion. Thus this cycle will lead to weight gain and chronic hyperinsulinaemia.(54,55). It has also been proved that obese people have an increased preference for fatty foods (71)which further enhances insulin output and adipose tissue depots.

The modern diet contains more fat and less fiber than the recommended levels. Studies have demonstrated that food containing saturated fat results in obesity as compared to food containing unsaturated fatty acids.(56–58). Fatty acids promote adipogenesis, and expansion of adipose tissue depots.(59) Studies have confirmed the positive association between a high-fat diet and obesity.((60,61)

Protein intake is positively associated with obesity (62,63)High protein and low carbohydrate food are proven intervention for reducing weight for obese people. (63)(Short-term high protein diets had beneficial effects on obesity and overweight and CAD risk. (64) But in contrary, one study has shown that 20% higher protein intake resulted in a 50% lower body weight regain (65)Regained weight consisted of fat-free mass only, and was related to increased satiety and decreased energy efficiency.

3.7.8 Physical activity:

A study done by white et al found that higher levels of physical activity was associated with low level of obesity.(66) Espara et al supported a significant role for physical activity in the prevention of obesity.(67) High levels of physical activity helps in not developing obesity, protection from other chronic diseases and enhances good health.(68–70) . Singh et al concluded in their urban cross sectional study that sedentary behavior was seen more with increasing age, female gender and increasing obesity. Physical activity is an important component for long-term weight control.(71)

3.7. 8 a Tool for measuring Physical Activity

IPAQ (International physical activity questionnaire) short form is an instrument used primarily for population surveillance. It has been developed and tested for use in adults for assessing physical activity (age range of 15-69 years). (72)

2 studies done in Vietnam and Asian population showed Criterion validity for the IPAQ ($\rho = 0.21$) accepted but lower validity. The SP2PAQ showed good validity and reproducibility for vigorous activity, but performed less well for moderate activity particularly in Indians. This questionnaires overestimated energy expenditure from physical activity to a greater extent at higher levels of physical activity than at lower levels of physical activity.(73,74)

Paul H lee et all in his review he has found that correlation between the total physical activity level measured by the IPAQ-SF. It's objective standards ranged from 0.09 to 0.39;None of the study in his reviews reached the minimal acceptable standard in the literature (0.50 for objective activity measuring devices, 0.40 for fitness measures).. Most of studies the IPAQ-SF overestimated physical activity level by 36 to 173 percent while one study alone underestimated by 28 percent.(69)

Paul H lee concluded that the correlation between the IPAQ-SF and objective measures of activity or fitness in most studies was lower than the acceptable standard. The IPAQ-SF typically overestimated physical activity. The evidence to support the use of the IPAQ-SF as an indicator of physical activity is not strong enough.

But one study done in North India by Ravi Prakash Upadhyay shown that IPAQ validity, spearman correlation coefficient ranged from 0.42 to 0.43 .IPAQ short form can be used to measure PA in community settings.(75)

IPAQ has validated in Punjab for Punjabi version and recommended for Indian population. The Spearman coefficient (ρ= 0.994) to (ρ= 1.00), indicating good validity.(76)

3.7.9 Depression

There are some common mental disorders associated with obesity. Depression, personality disorder and anxiety are some of them.(6).There was a statistically significant and positive relationship between depression and BMI (r = .201, p< .01) in a study done among women.(77).Many studies have been done and have confirmed positive association of obesity with depression. The association works bidirectionally. Obesity is a risk factor for depression and depression is a risk factor for obesity .(78)

One study found that being overweight has 1.27 times increased risk of developing depression. (79) Another study found that the prevalence of depression was 6.5% in overweight women and 25.9% in women with BMI >35.(80).

The prevalence of obesity was 25.4% in patients with no depression symptoms, It has jumped to 57.8% in those with moderate or severe depression.(81) A cross-sectional

study conducted on 323 young adult females by Pin Lin et al showed depression has positive association with obesity (odds ratio = 1.17, 95% CI = [1.11, 1.23], $p < .001$).(81)

3.7.10 Obstetrical risk factors:

A longitudinal growth study demonstrated that prevalence of obesity in women who reached menarche before the age of 11 was 15% while it was 4% in those who reached menarche after 15 years of age.(82) Fat accumulation during childhood increases the chances of early menarche. Longer period of positive energy balance has been noticed in girls with early sexual maturation .(83–85)

A number of studies have shown that a positive relationship exists between gestational weight gain and obesity. Fraser found that women who gained more than the recommended weight during pregnancy (by 2009 Institute of Medicine guidelines) had three times higher risk of becoming overweight or obese .(86) Failure to lose weight and excess weight gain after pregnancy are important and identifiable predictors of long-term obesity.(87)

Shilpy et al found significant and positive correlation between obesity and parity.(88)This study also demonstrated negative association between fewer pregnancies and obesity.(105) A study showed women with parity one or two were less obese (OR =

0.75; 95% CI, 0.64-0.88) than nulliparous or multiparous women. Multiparous women had more visceral obesity than other parity groups(89)Gouda et al in his review shown that obesity has positive association with increasing parity.(8)

There is an association between mode of delivery and obesity and this association works bidirectionally.There are not enough studies with mode of delivery as a risk factors for obesity. Maternal obesity is associated with higher rates of cesarean section (90)

Maternal obesity is also associated with a decreased intention, initiation and duration of breastfeeding.(91)One study done by Brenda et al proved that Women who breastfed had significantly lower weight gains.(87)

3.8 Medical conditions associated with obesity:

Obesity negatively impacts the health of women in many ways. Women who are obese have higher risk of developing diabetes and coronary artery disease.(92–94)Clinical and epidemiological studies have shown that obesity is commonly associated with hyperlipidemia. But Batisa et al showed that after adjusting for age, association between hyperlipidemia and obesity became weak.(95–97) Obesity is an independent risk factor for the development of coronary artery disease (CAD) in women. It is an important modifiable risk factor for prevention of CAD.(98) In a study of 37,000 women in

United States, women with a BMI 35 had an odds ratio (OR) of 2.7 for CAD and an OR of 5.4 for hypertension.(99)

Abdominal obesity was more harmful in women than BMI or weight. Both.normal weight women and overweight women , waist circumference is an independent risk factor for developing CAD.(98)The Inter heart global study of 6787 women from 52 countries found that abdominal fat was more predictive of myocardial infarction than BMI. (100)

Being obese or overweight increase the relative risk of low back pain and knee osteoarthritis. (101–104). Obesity has been implicated in the development or progression of low back pain and knee osteoarthritis (OA) in women. The mechanism by which obesity causes lumbar back pain is poorly understood, but the contribution of both mechanical and system factors is likely.(102)

Obesity is negatively associated with contraception and fertility. (102–106) Obese women have higher risk for many cancers, (endometrial cancer, breast cancer , cervical cancer, and ovarian cancer).(107–109)

4. METHODOLOGY

4.1 Study setting

Vellore Municipal Cooperation is situated in Vellore district in the state of Tamilnadu, South India. Vellore has four zones with a total of 60 wards covering an area of 87.915 square kilometers and has a population of 3,936,331 of which males and females were 1,961,688 and 1,974,643 respectively. Vellore is an urban area, classified as a class 1 town. Out of the total Vellore population, 43.24 percent (1,701,987) live in urban area of Vellore district. Total no of males are 844,587 and females are 857,400 females residing in Vellore urban region. The female literacy rate in urban Vellore is 79.8%, which is equal to the national urban average of 79.9 %.(113).

The study area for this research included 12 of the 48 wards from Vellore Municipal Corporation where a cross sectional study was carried out in 2012 for studying risk factors for non-communicable diseases using the WHO STEPS method. All women participants between the 30 to 40 years from the previous study formed the sampling frame for the current case control study.

4.2 Study design:

Unmatched case control study

4.3 Sample size

The study was powered to detect 2.5times greater odds of overweight (BMI ≥25 kg/m^2) among those with high SES as compared to those with lower socioeconomic status.

Assuming that P0 (prevalence of risk factor among controls) =25%, and R (odds ratio of 2.5, based on the results from the previous ICMR study relating overweight and education), the prevalence of risk factor among cases is given by P1

$$p_1 = \frac{p_0 R}{[1 + p_0 (R - 1)]}$$

P1=45.5%

Sample size n was calculated as:

$$n = \frac{\left(z_\alpha \sqrt{2\,\bar{p}\bar{q}} + z_\beta \sqrt{p_1 q_1 + p_0 q_0}\right)^2}{(p_1 - p_o)^2}$$

where

$$\bar{p} = \frac{p_1 + p_0}{2}$$

$$\bar{q} = 1 - \bar{p}$$

$$q_1 = 1 - p_1$$

$$q_0 = 1 - p_0$$

Assuming alpha error of 5% (Z alpha = 1.96) and 80% power (beta=.84)

N=85 in each arm, cases and controls.

4.4 Definition of cases and controls:

Definition of cases:

Any woman (aged 30-40) in urban Vellore, with current BMI ≥25 kg/m^2 from the selected wards, who participated in the previous study

Definition of controls:

Any woman (aged 30-40 years) in urban Vellore with current BMI< 25 kg/$m^2$from the selected wards and who participated in previous study

Total number of women with BMI ≥25 kg/m^2in 2012 study was 264 who were considered potential cases for the current study. Potential controls from the previous study participants with BMI < 25 kg/m2 were 209.

Inclusion Criteria and Exclusion Criteria

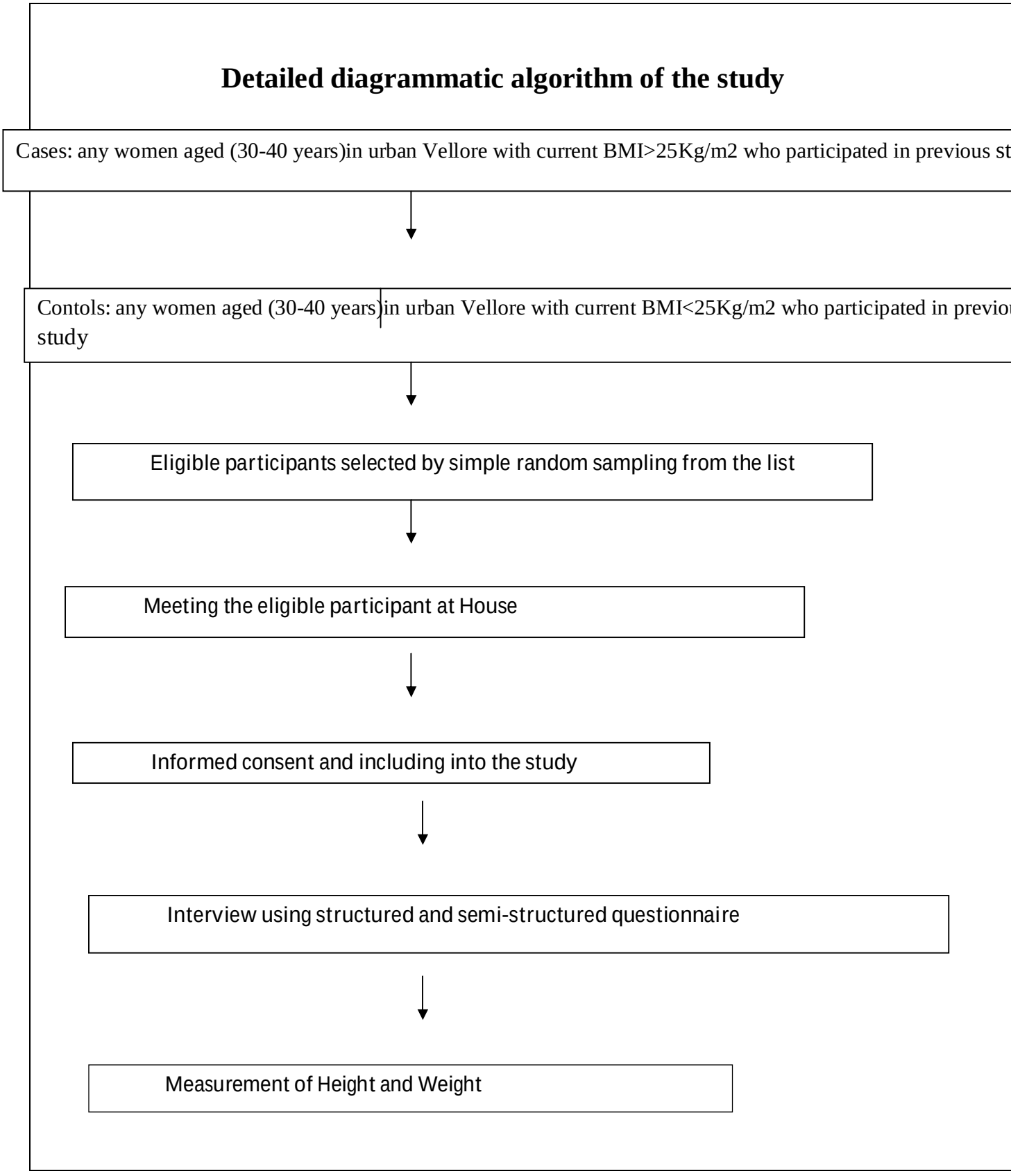
Exclusion criteria: All pregnant women.

Study Period: February 2015 to August 201

4.6 Selection of cases and controls

A list of potential cases and controls without any mention of previous BMI was prepared by a faculty in the department. Assuming 20% loss to follow up from the list, 220 participants from the previous study were selected by simple random sampling. After exhausting this list, additional women were approached by visiting consecutive wards (arranged alphabetically), starting from a randomly selected ward. These women came from the remaining 253 women in the sampling frame.

Detailed diagrammatic algorithm of the study



4.8 Data collection:

Data collection was done by direct interview by principal investigator by questionnaire, extraction of information from patient retained records and actual measurement of height and weight.

4.9 Study tools: Study tool had 4 components.

- Structured questionnaires to identify socio demographic factors, medical history and dietary intake
- Validated questionnaire for assessing risk factors like Depression/common mental disorders (GHQ-12) and physical activity (IPAQ)
- Antenatal records for gestational weight gain
- Assessments of height and weight

Questionnaires are attached in annexures.

Structured questionnaire to identify socio demographic factors, medical history and dietary intake

After obtaining valid informed consent from participants a direct interview was done using a structured, pre-tested, interviewer administered questionnaires. Socio demographic characteristics, socioeconomic status using the modified Kuppusamy scale,history of diabetes, hypertension, hyperlipidemia and Coronary Artery Disease (CAD) were also obtained.

All women with at least one child were asked about the history of breast feeding and mode of delivery for the last child.

Dietary intake was assessed by a single 24 hour recall. Standard cups, glasses, and spoons were used to assess the amount (weight/volume) of food consumed by the participants. If the previous 24 hours included festivals or fasting, the day before was taken into account. Nutrients like calories, protein, fat and carbohydrate present in the food were calculated using the database of "Nutritive Value of Indian Foods"developed by the National Institute of Nutrition (NIN)(114). The nutrients from the ready-made foods like biscuits and other packaged food items were calculated from the information given by the manufacturers.

b. Validated questionnaire for assessing common metal disorders:

The 12 item General Health Questionnaire (GHQ-12) was formulated by Goldberg (1972) and used to screen for common mental disorders (CMD) in primary care setting. It has

been validated in different languages and cultures. The optimal threshold for the GHQ-12 was 2/3. This threshold had sensitivity 87.4% and a specificity of 79.2%.(115) Three factors were extracted with Eigen values of 5.0 (depression-anxiety), 1.7 (social performance) and 1.1 (self-esteem) which explained 42.0%, 13.9% and 9.2% of the variance. The split half-reliability was 0.83 while the Cronbach′s alpha was 0.86. The sensitivity(87.4%) and specificity (79.2%)of the Tamil version of the GHQ-12 is high. The factor structure is similar to that reported in other populations. The instrument can be employed as a screening instrument in this population.

This questionnaire has twelve questions with four multiple choice answers codeda, b, c, and d. Participants can choose only one answer from the choices.

They werescored 0—0—1—1 for a, b, c, d respectively. All scores from each question were added up to get a final score (minimum-0, maximum-12). Participants who scored >=3 were considered to have a common mental health disorder needing further evaluation

Validated questionnaire for assessing physical activity:

IPAQ (International physical activity questionnaire) short form is an instrument used primarily for population surveillance. It has been developed and tested for use in adults for assessing physical activity (age range of 15-69 years). IPAQ assesses physical activity undertaken across a comprehensive set of domains including: domestic and gardening activities, work-related, leisure time and transport related activities

The IPAQ short form asks about three specific types of activity undertaken in the four domains mentioned above as walking, moderate-intensity and vigorous-intensity activities in the previous week. The items in the IPAQ short form provide separate scores on walking, moderate-intensity and vigorous-intensity activities. Computation requires summation of the duration (in minutes) and frequency (days) of the three activities.

There are three classifications

- inactive or low or category 1
- minimally active or medium or category 2
- highly active or high or category 3

Detailed algorithm for scoring is mentioned in annexure.

IPAQ questionnaires produces repeatable data (Spearman's rho clustered around 0.8).The IPAQ instruments have acceptable measurement properties. This short form is at least as good as other established self-reports and used for monitoring population levels of physical activity among 18- to 65-yr-old adults in diverse settings. (87)The short IPAQ form is recommended for national monitoring. The long form is recommended for research requiring more detailed assessment.(87)

4.10 MEASURING TOOLS

Stadiometer

The mobile stadiometer 217 of Seca Company was used for the study. Its speciality is its top quality material and skill-fully designed assembly system. It is easy to carry around for medical examinations.

The fold away height measuring rod and the platform of this stadiometer can be attached easily comparing to wall mounting type which needs a support for it to be fixed. The strong and large platform can be used at any place. The connections in between and the rod prevent it from shaking and moving. The headpiece shows the exact measurement as the subject stands on the platform. It has clearly marked scale on both sides, graduated in mm that helps in reading the result and can measure height up to 205 cm.(116) Height was checked three times by stadiometer average was taken

The technique of measuring height

- The subject should stand against the measuring rod with back, buttocks and heels touching and the heels must be together.
- Both arms and the shoulders should be relaxed and held loosely at the sides.
- The head must be in “Frankfort horizontal plane”. It is the line joining the margin of the lower eyelid and the upper margin of the external auditory meatus.

- Now the headpiece is brought to the top of the head, so that it helps to take proper measurement and does not get alter with the type of hairs.

Digital floor scale:

It has equipped with high precision strain gauze sensor with capacity of 150kg maximum. It batteries powered and can register weight in increments of 100 grams.(117).

One should be careful to watch out for the display of zero between every measurements.

One should be careful about correct position of subject and to remove shoes, shawls etc before weighing. Weight was checked three times and average was taken

4.11 DATA ANALYSIS

4.11a Descriptive Analysis:

The socio-demographic characteristic and other variables of the study population have been presented using frequency and percentages for categorical variables and mean ± SD for continuous variables. Similarly, exposure factors are also described.

4.11b Risk factor Analysis:

Bivariate analysis was done using Chi square test to study the associations between categorical variables. Independent t test was done to compare means between two groups. Uni-variate analysis was done to generate an odds ratio and 95% confidence interval for the risk factors. Risk factors which had significant p values were included in the multivariate analysis by a backward conditional logistic regression model.

To check dose response relationship, Risk factor analysis was done for (women with BMI>30) and (women with BMI<25) also.

4.12 Dietary risk factors:

Each participant's ideal weight is calculated by Robinson formula for women.

Ideal Body Weight (in kilograms) = 49 kg + 1.7 kg for each inch over 5 feet.(118).

Energy

Calorie requirement for a particular woman is calculated with respect to her physical activity and for her ideal body weight according to the "Nutrient requirements and recommended dietary allowances for Indians by ICMR.(119). The recommendations are as follows,

Sedentary woman for her ideal body weight -35 kcal/kg/24hours

Minimally active woman for her ideal body weight-41kcal/kg/24hours

Highly active woman for her ideal body weight -52kcal/kg/24 hours

For analysis, women who were taking more than recommended for their ideal body weight and physical activity were compared with women who were taking either equal or less than required

Fat:

Fat requirement for a particular woman for ideal body weight and physical activity were calculated as given below,

Sedentary woman for her ideal body weight -20g/day

Minimally active woman for her ideal body weight-25g/day

Highly active woman for her ideal body weight -30g/day

Safe level of fat is -50g(119). For analysis comparison between women who were taking more than 50g and women were taking equal to or less than 50g were considered.

Protein:

Each women irrespective of their physical activity for their weight requires 0.83g/kg/day .(119)

For analysis women who take more than required amount of protein were compared with women who were taking equal to or less than recommended

Carbohydrate:

One gram of carbohydrate gives four kilo calories.65-80% of total energy intake should be contributed by carbohydrate.(119) This was calculated individually for each participants. For analysis women who were taking more than 80% of total energy intake from carbohydrate were compared with women all others.

4.13 Bias:

1. Recall bias-

Recall bias may occur in assessing diet, exercise and obstetrical risk factors. Underestimation of diet is a distinct possibility and therefore the PI will use standard bowls to get the amount of food as accurately as possible.In order to avoid inaccuracies in obstetrical risk factors bias, the interviewer will look at documents such as antenatal cards. The recall bias is expected to be non-differential bias as we do not expect BMI to influence these exposure histories.

2. Interviewer Bias:

Interviewer may have some bias as the case or control status may be obvious by looking at the subjects. The list of cases and controls will be given to the interviewer by a co-guide who will not indicate which ones are the cases or controls. Height and Weight will be checked only after administering the questionnaires to minimize this error.

3. Measurement bias

Measurement bias can arise from weighing machine and stadiometer. To avoid that weighing machine will be used after calibration with a standard weight. Height of the subject will be checked twice and the average will be taken for analysis.

4.13 Implication of the study size-

.The sample size calculated for this study was 85 cases and 85 controls. Due to the gap between the cross sectional study in 2012 and the current study more women in the sample had become overweight or obese. This resulted in 112cases and 58 as controls.

5. RESULTS

5.1.1 Demographic characteristics of study population:

A total of 170 women were recruited in the study, among whom 112 were cases (BMI ≥ 25 kg/m^2) and 58 were controls.

The socio-demographic characteristics are shown in Table 5.1. The mean age of cases and controls were 37.13 (sd 2.08) and 36.29 (sd2.87) years respectively.

Table 5.1aSocio-demographic characteristics of study population

Variable	Categories	Cases (BMI ≥25 kg/m^2) N=112 No (%)	Controls (BMI < 25 kg/m^2)N=58 No (%)
Age (years)	30-35	30(26.7)	24(41.3)
	36-40	82(73.3)	34(58.7)
Religion	Hindu	95(84.8)	49(84.5))
	Christian	10(8.9)	7(12.1)
	Muslim	7(6.3)	2(3.4)
Marital status	Married	102(91.1)	49(84.5)
	Single	4(3.6)	5(8.6)
	Separated	1(.9)	0
	Widow	5(2.9)	4(2.4)

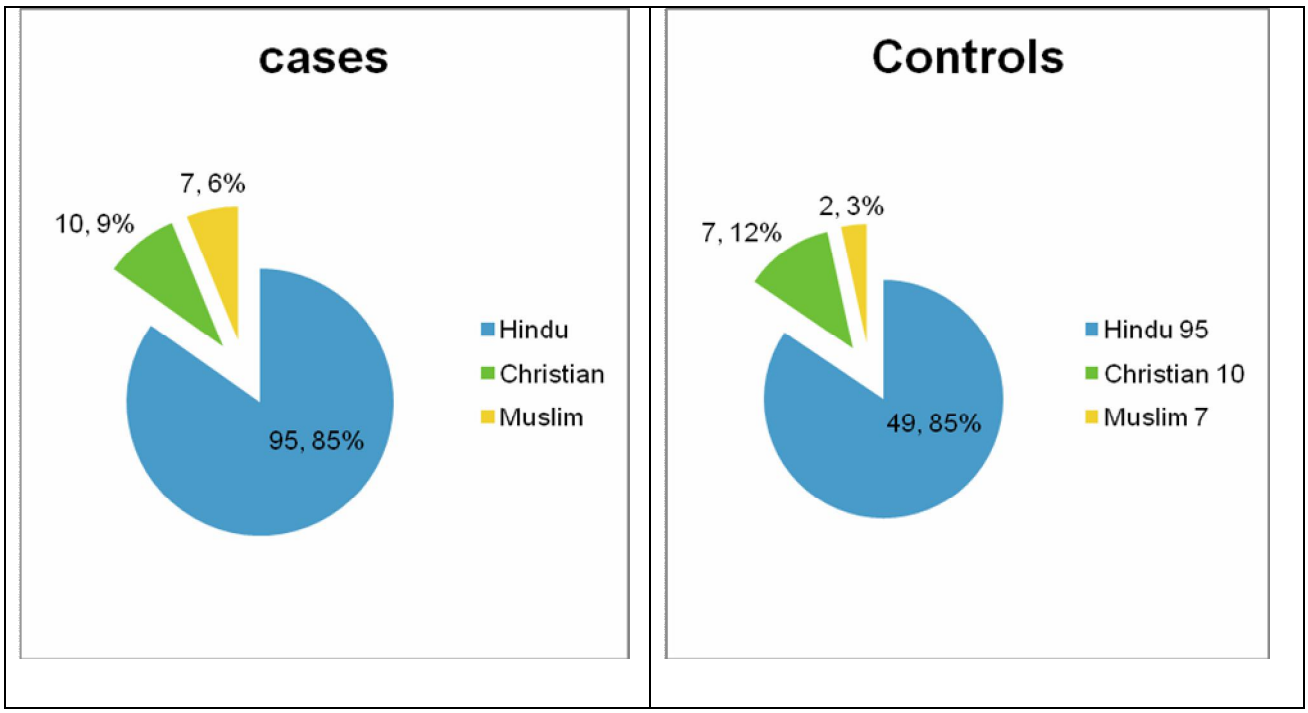


Figure 5.1 Distribution of Religion among cases and controls.

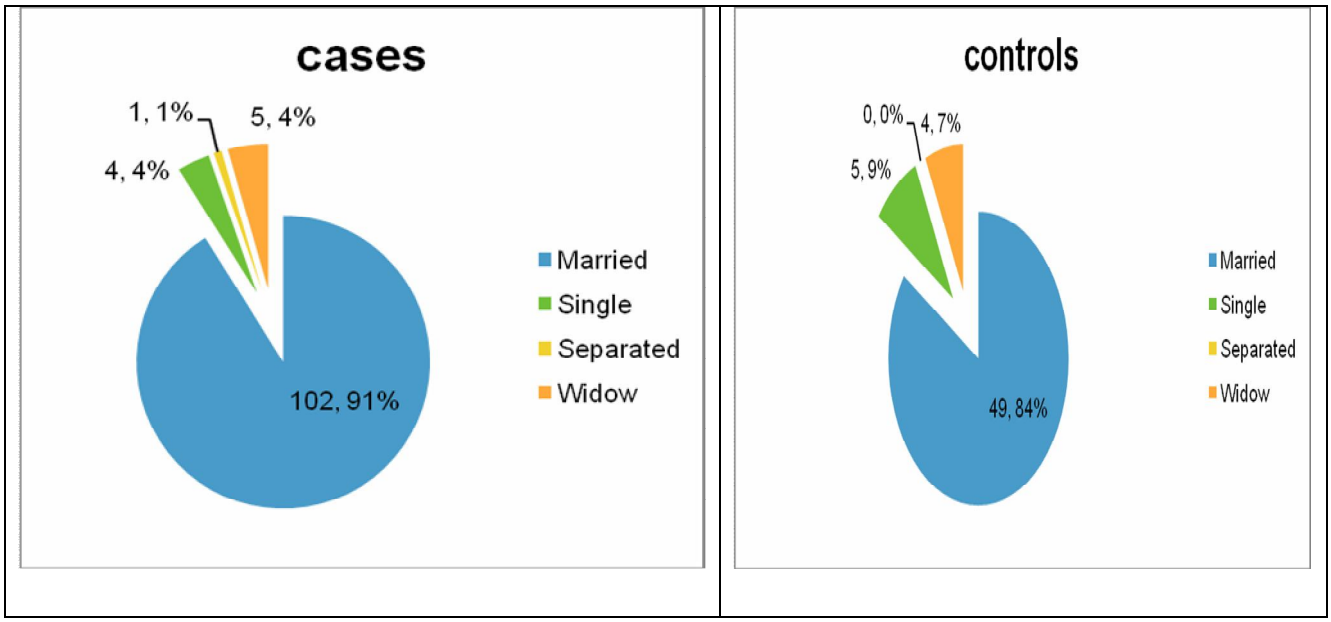


Figure 5.2 Distribution of marital status among cases and controls

Among the cases and controls, the illiteracy rate was 22.3% (25) and 32.8% (19) respectively. Majority of cases and controls had studied beyond middle school level (64.3% and 52.2% respectively). Only few had studied beyond 12th grade. Majority of cases and controls (81%) were house wife alone.

According to Modified Kuppusamy Scale, 50%of cases were from whereas only 32.7% of controls were from middle/upper group. Majority of controls were from upper middle socio-economic group (63.8%).

Figure 5.3 SES status among cases and controls

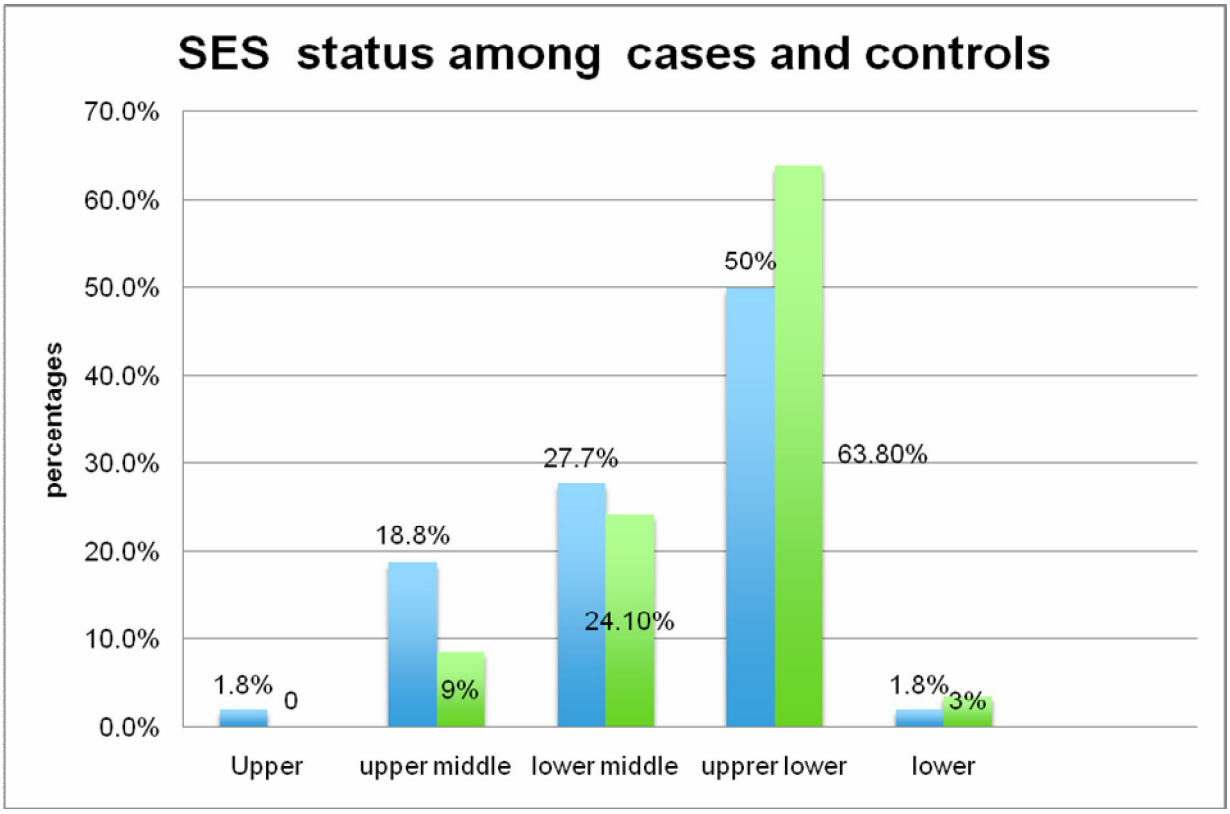


Table 5.1bSocio-demographic characteristics of study population

Variable	Categories	Cases (BMI ≥25 kg/m^2) N=112 No (%)	Controls (BMI < 25 kg/m^2)N=58 No (%)
Occupation	Housewife alone	91(81.3)	47(81)
	Unskilled	12(10.7)	9(15.5)
	Semiskilled/skilled	6(5.4)	1(1.7)
	Clerk, supervisor	1(.9)	0
	Semiprofessional	2(1.8)	1(1.7)
Literacy	Illiterate	25(22.3)	19(32.8)
	Literate	87(77.7)	39(67.3)
Education	Nil	13(11.6)	10(17.2)
	1-4	5(4.5)	3(.2)
	5-8	22(19.6)	13(22.4)
	9-10	50(44.6)	24(41.4)
	11-12	15(13.4)	5(8.6)
	>=13	7(6.3)	3(5.2)
SES category(Modified Kuppusamy scale)	1 Upper	2(1.8)	O
	2-Upper Middle	21(18.8)	5(8.6)
	3-Lower Middle	31(27.7)	14(24.1)
	4-Upper lower	56(50)	37(63.8)
	5-lower	2(1.8)	2(3.4)

Figure 5.4 literacy status among cases and controls

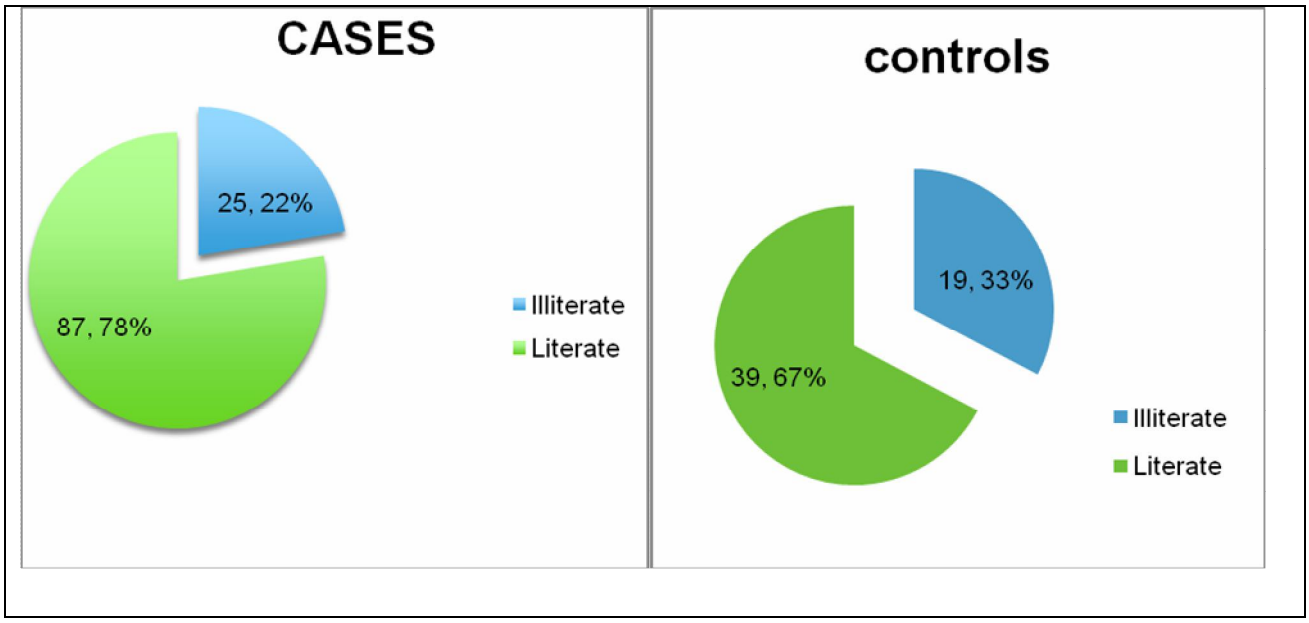
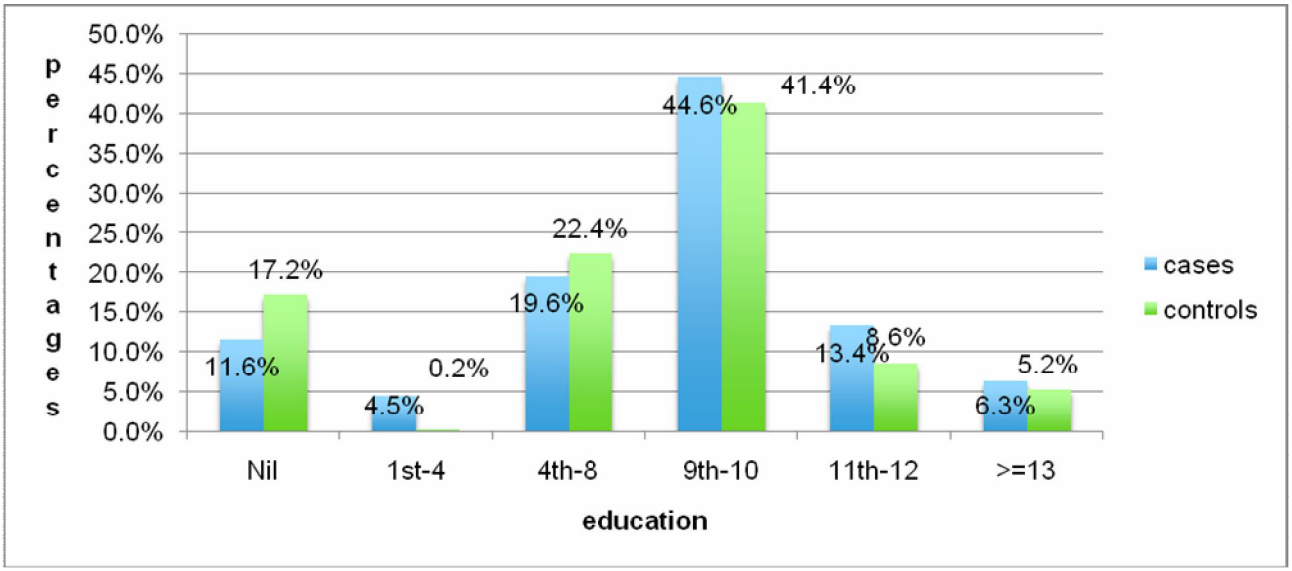


Figure 5.5 Education distribution in cases and controls



5.1.2 Medical history of study population

Study participants were screened for Diabetes, Hypertension, Dyslipidemia during the year 2012 as part of a WHO STEPS study. Participants were asked about their current health status (Diabetes, Hypertension, Dyslipidemia and Depression). Table 5.2b gives the details of their present health status.

Table 5-2a Medical history of cases and controls:

Variable	**Category**	**Cases N=112** **n (%)**	**Controls N=58** **n (%)**
Diabetes	Yes	4(3.6%)	2(3.4%)
	No	108(96.4%)	56(96.6%)
Hypertension	Yes	4(3.6%)	1(1.7%)
	No	108(96.4%)	57(98.3)
Hyperlipidemia	Yes	14(12.5%)	3(5.2%)
	No	98(87.5%)	55(94.8%)
Treatment	Yes	4(3.6%)	1(1.7%)
Depression(history)	No	108(96.4%)	57(98.3%)

Among cases and controls, more than 96% did not have diabetes/hypertension. All participants who were diagnosed to have diabetes and hypertension among both cases and controls were taking treatment regularly.

Among the cases, 12.5% had dyslipidemia as compared to 5.2% in controls. Of the total 17 participants with dyslipidemia, only one (case) was on treatment.

Based on medical history, 3.6% of cases and 1.7% of controls were on treatment for depression. Table 5.2b gives the details on other medical conditions among cases and controls.

Table 5:2b Other Co-morbidity among study participants

Medical history	No
Seizure disorder- control	1
AtrilSeptal Defect-control	1
Bronchial Asthma -case	2
Hypothyrodism-case	2
Sheehans syndrome-case	1
Tuberculosis-case	1
Varicose vein-case	1

5.1.3 Diet

Calorie, Protein, Fat intake in study participants

.Energy requirement for each individual was calculated based on their ideal body weight and level of physical activity. The diet of amajority of the study population was deficient in calories(77.7% of cases and 93.2% of cases).

Regarding protein intake, The diet of 43.8% of cases and 75.9% of controls had less than recommended protein

More than 50grams of fat per day was consumed by 48.3% of cases and 29.3%of controls. In this study,16.1% of cases and 24.1 % of controls weretaking more than 80% of energy requirement from carbohydrates.

The mean intake of calorie, protein and fat is given in Table 5.3

Table 5.3 Mean calorie and protein intake between cases and controls:

Variable	Category	Mean(SD)	Mean difference (95%CI)	T-test p-value
Calorie	Case (112)	1644.65(408.26)	**204.85** (80.99-328.71)	0.001*
	Control (58)	1439(344.61)		
Fat	Case (112)	33.85(17.9)	6.71 (1.70-11.72)	0.009*
	Controls (58)	27.14(14.35)		
Protein	Cases (112)	45.93(15.76)	6.984 (2.09 –11.87)	2.82
	Controls (58)	38.95 (14.352)		

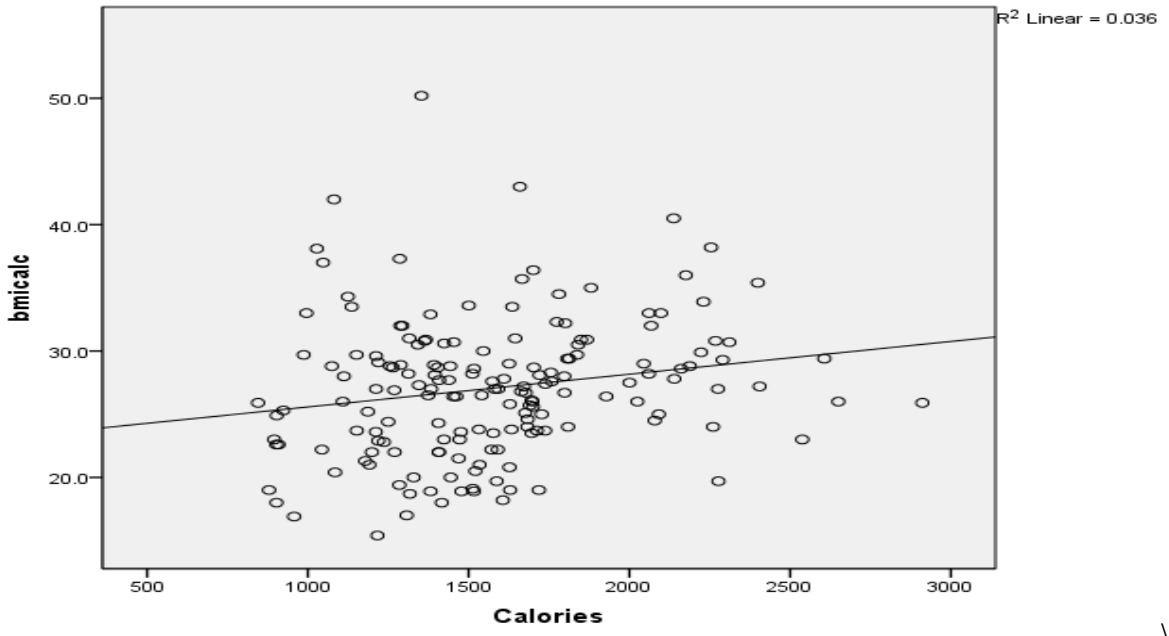
*Statistically significant

Difference in mean calorie,protein and fat intake between cases and controls were found to be significant

Table 5-4 Calorie, Protein, Fat intake in study participants

Varaible	category	Cases(N=112) N(%)	Controls 58 N(%)
Calories	more than recommended for index participant	25(22.3%)	4(6.9%)
	less than required	87(77.7%)	54(93.1%)
Protein	Less than required for index participant	49(43.8%)	44(75.9%)
	More than required for index participant	63(56.3%)	14(24.%)
Fat	More than maximum level of fat(50g)	49(43.8%)	17(29.3%)
	Less than maximum level of fat(50g)	63(56.3)	41(70.7)
Carbohydrate	Takemore than 80% of energy requirement from carbohydrates	18(16.1%)	14(24.1%)
	Take less than 80% of energy requirement from carbohydrates	94(83.9%)	44(75.9%)

Figure 5. 6 Scatter Plot diagram showing relation between calorie intake and BMI



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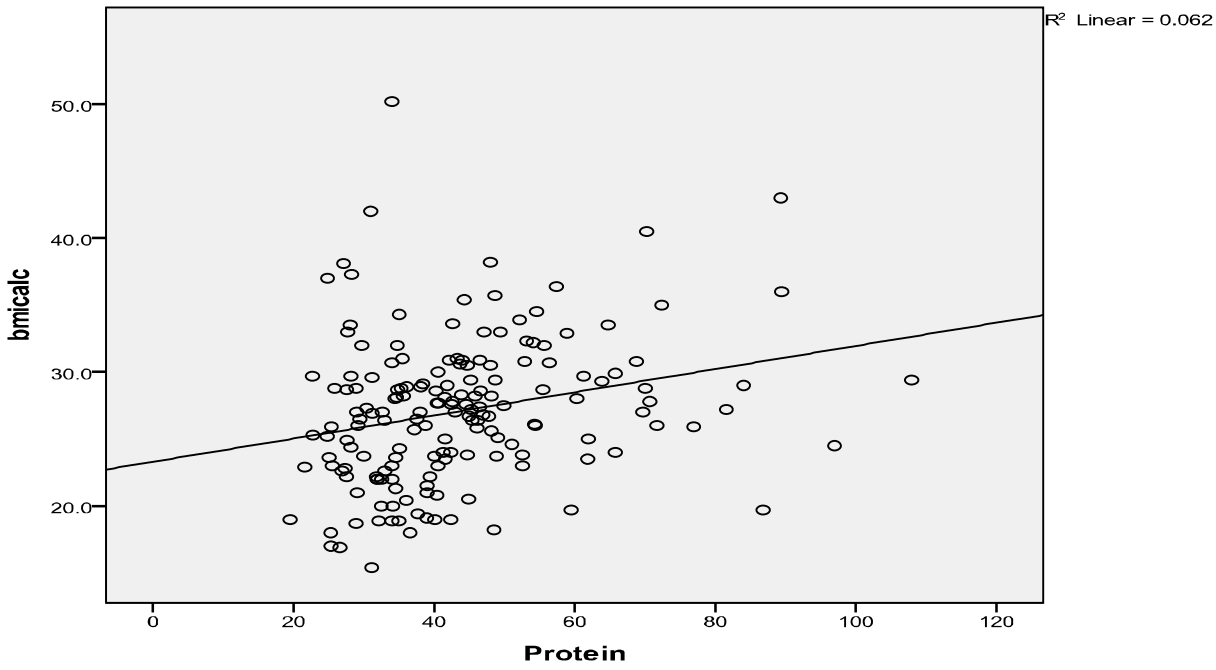
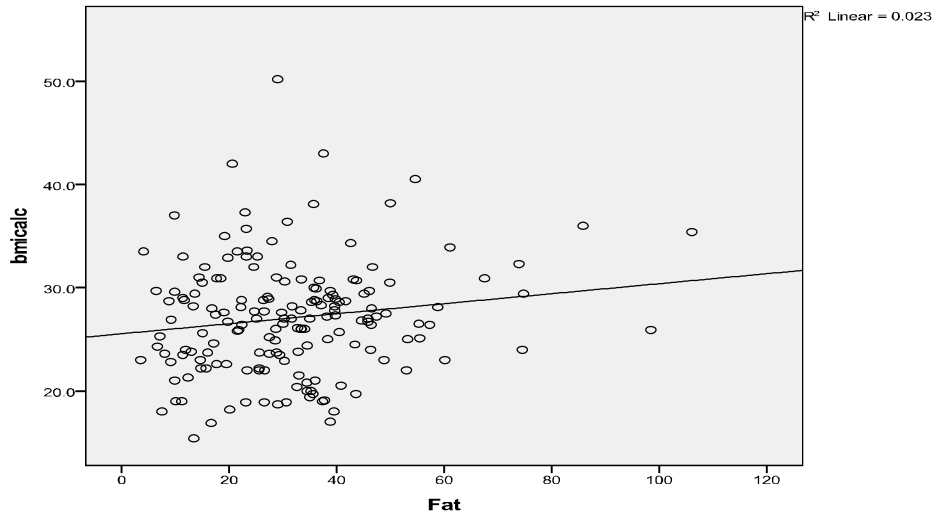
Pearson correlation 0.19(p value-0.012)-Statistically significant

Figure 5. 6 Scatter Plot diagram showing relation between protein intake and BMI



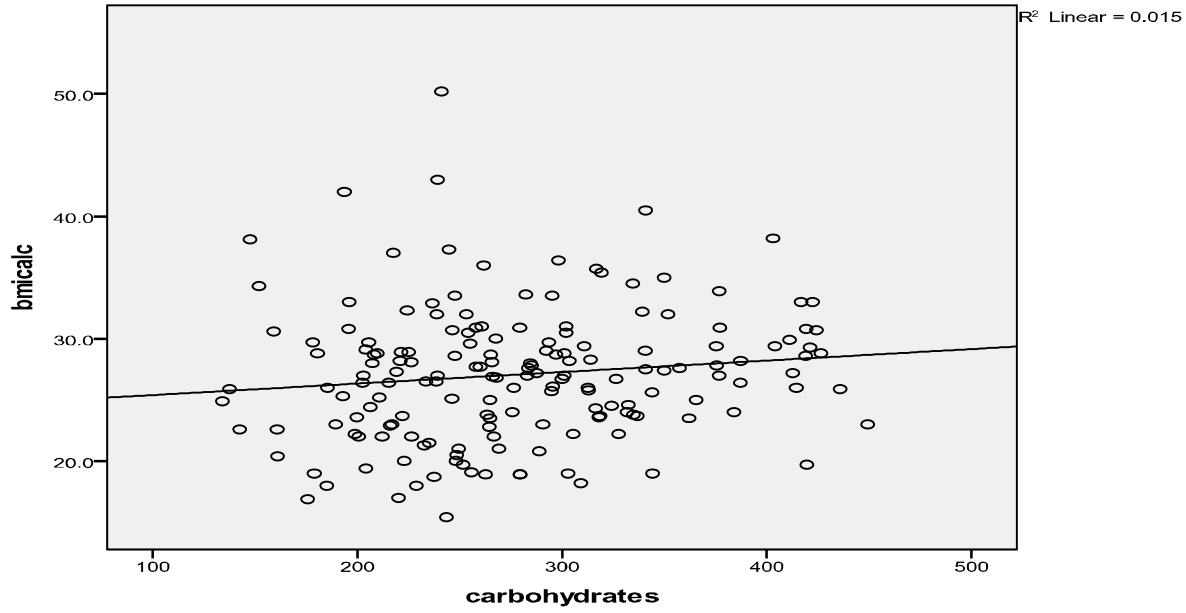
Pearson correlation - 0.25(p value-0.001)-Statistically significant

Figure 5. 7 Scatter Plot diagram showing relation between fat intake and BMI



Pearson correlation- 0.15(p value-0.045)-Statistically significant

Figure 5. 8Scatter Plot diagram showing relation between carbohydrate intake and BMI



Pearson correlation- 0.13(p value-0.09)-Statistically not significant

5.1.4 Exercise among study participants

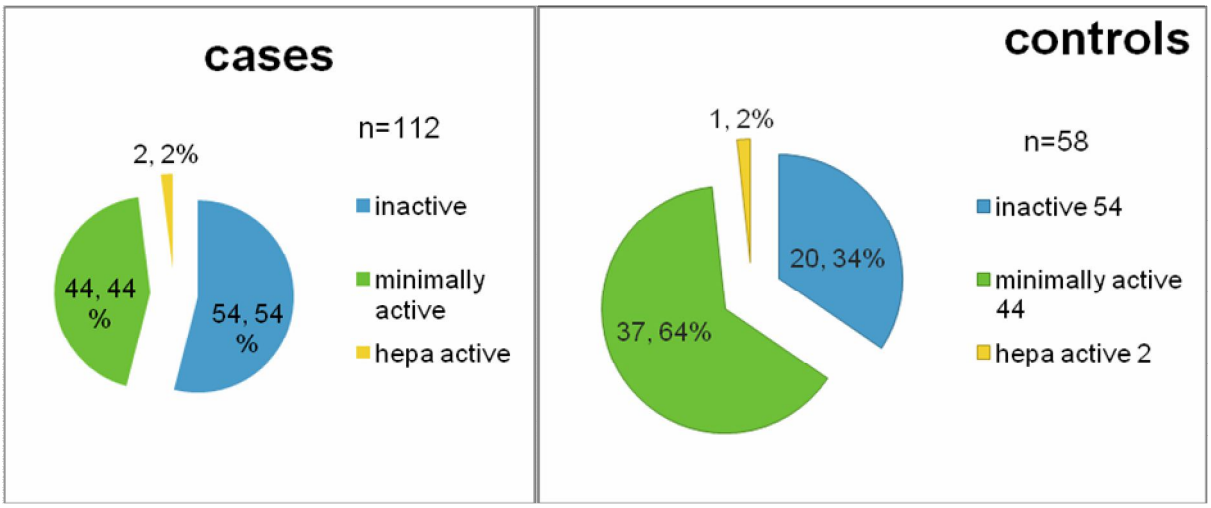
Physical activity is graded into inactive (category -1),minimally active (category 2) and health enhancing physical activity (HEPA)- a high active category(category 3) using IPAQ scale Almost half of the cases and 35% of controls were inactive.

TABLE 5.5 Physical activity classification based on IPAQ scale

Level of physical activity	Cases N=112	Control N=58
Inactive	49(43.8)	20(34.5)
Minimally active	61(54.5)	37(63.8)
High active (HEPA)	2(1.8%)	1(1.7%)

Based on IPAQ scale, 43.8% of cases and 34.5% of controls were physically inactive. 54.5% of cases and 63.8% of controls were minimally active. The proportion of participants with health enhancing physical activity was negligible (<2%) in both cases and controls.

Figure 5. 9 Physical activity among cases and controls



5.1.5 **Common mental disorders as assessed by general health questionnaire12**

Individuals were classified as 'having symptoms suggestive of common mental disorder' if the total score was more than two. The maximum possible score was 12. Around 30% of both cases and controls had symptoms suggestive of common mental diseases

Table 5.6 'Symptoms suggestive of common mental disorder' among cases and controls.

Variable	category	Cases n=112 N(%)	Controls n=58 N(%)
	Present (GHQ score >2)	37(33%)	18(31%)

common mental disorder	Absent (GHQ score 0-2)	75(67%)	40(69%)

5.1.6 Obstetric factors.

Majority of women attained (80% both cases and controls) attained menarche at the age of 13 or above.5.6% of cases and 7.4% of controls never became pregnant after 3 years of marriage

TABLE 5.7 Comparison of obstetric risk factors in cases and controls.

Variable	Category	Cases n=112 N(%)	Controls n=58 N(%)
Parity	Nullipara(unmarried)	4(3.6%)	4(7.4%)
	Nullipara (married)	6(5.6%)	4(7.4%)
	Para 1	5(4.6%)	5(9.3%)
	Para 2	69(63.9%)	28(51.9)
	Para 3	27(25%)	14(25.9%)
	Para 4	1(.9%)	3(5.6%)
Living children	0	6 (5.6%)	4(7.4%)
	1	5(4.6%)	5(9.3%)

	2	70(64.8%)	30(55.6%)
	>=3	27(25%)	15(17.6%)

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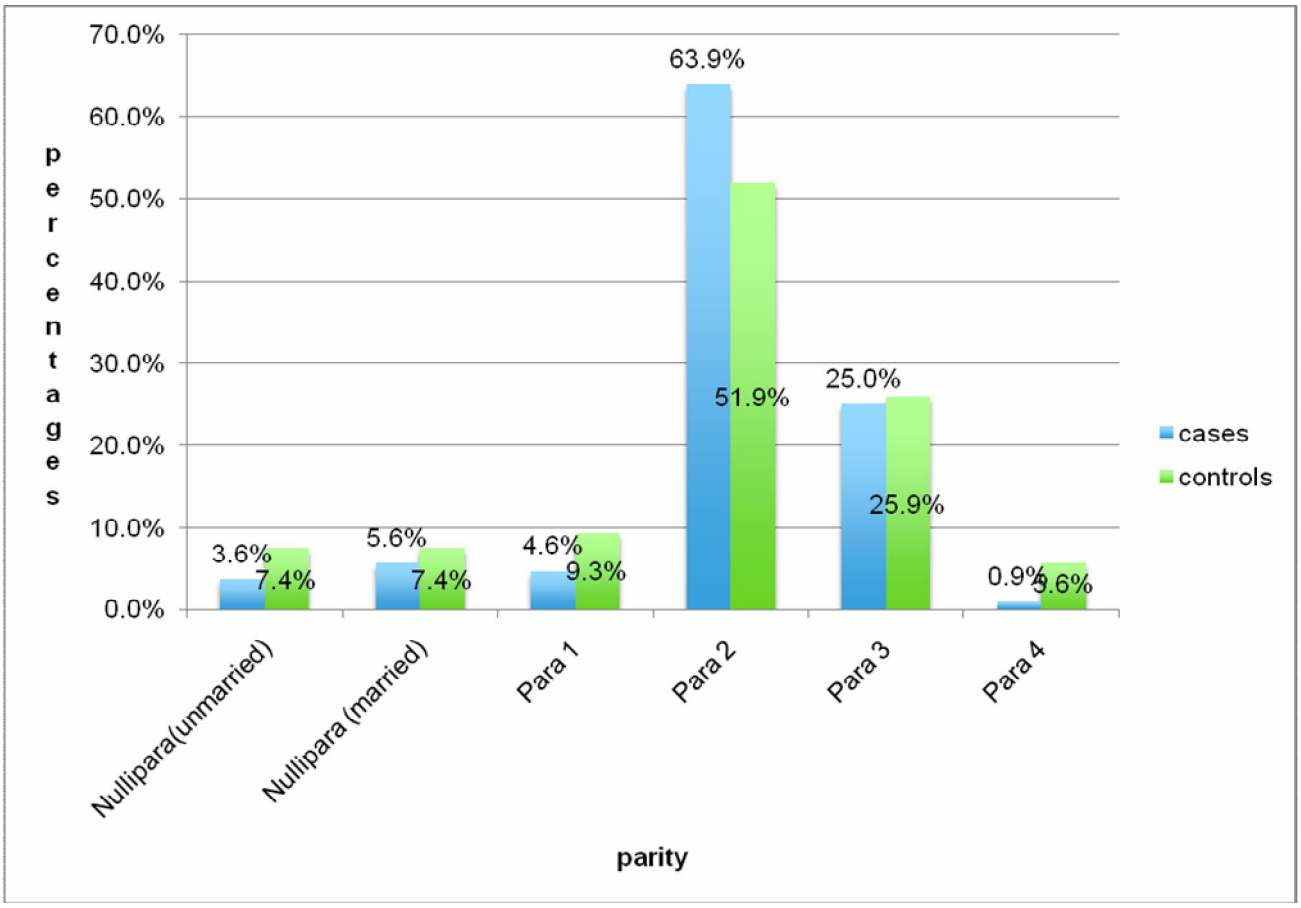
Figure 5.10 Parity among cases and controls



25% of cases and controls had parity of more than 3 and 63.9% cases and 51.9% controls were parity 2. Mode of delivery of the last pregnancy was LSCS in 20.6% of cases and 8.2% of controls

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5.1.7 BODY MASS INDEX:

Body mass index of participants was computed and cases and controls were classified according to WHO classification. According to WHO classification, 10.3% (6) of controls were underweight (BMI <18.5). Among the cases, 35.7% (40) were obese (BMI ≥ 30) according to WHO classification

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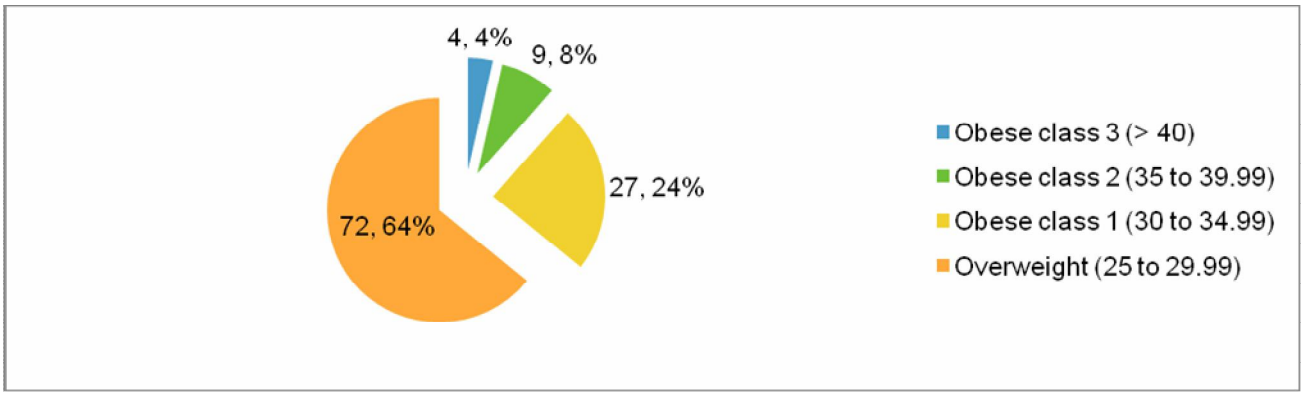
TABLE 5:8Nutritional status of cases according to WHO classification

Category	N (%)
Obese class 3 (≥ 40)	4(3.6%)
Obese class 2 (35 to 39.99)	9(8.0%)
Obese class 1 (30 to 34.99)	27(24.1%)
Overweight (25 to 29.99)	72(64.3%)

Figure 5.11 Nutritional status of cases according to WHO classification



5.2 UNIVARIATE ANALYSIS

RISK FACTORS FOR OBESITY /OVERWEIGHT IN WOMEN

Information on various potential risk factors were collected and analyzed to assess their association with young women having obesity/overweight. Results are presented under separate sections as socio-demographic factors, medical co-morbidity, diet, physical activity, depression and obstetric factors.

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5.2.1 Socio-demography factors and its association with obesity

Age, occupation, literacy, education in years were dichotomized and analyzed to find out whether these risks were associated with obesity/overweight status. Table 5-9 gives details on the different socio-demographic variable and its association. None of the above mentioned variables was significantly associated with overweight/obesity.

Table 5.9 socio demographic factors and overweight/obesity

	Riskfactor	Cases No (%)	Controls No (%)	p value	OR unad-justed	95 % CI	
						lower	upper
Age	age>36	72(64.2%)	29(50 %)	0.072	1.8	0.946	3.4
Literacy	illiterate	5(4.5%)	3(5.2%)	0.836	0.857	0.197	3.7
Education	Education <8 years	40(35.7%)	26(44.8%)	0.248	0.684	0.358	1.304
Occupation	housewife	91(81.3%)	47(81%)	0.973	1.014	0.451	2.280
Marital status	married	102(91.1%)	50(85%)	0.196	1.873	0.715	4.907

Study participants were dichotomized into high (upper and upper middle) and low (lower middle and lower) to study the association between SES and overweight/obese.

Table 5: 10 Socioeconomic status of family and overweight/obesity

SES	Cases-112 No (%)	Controls-58 No (%)	p value	Oddsratio unadjusted	95% CI	
					lower	upper
High	23(20.5)	5(8.6)	0.047*	2.74	1.09	7.63
Low	89 (79.9%)	53 (91.4%)				

*Statistically significant.

20.5% of cases and 8.6% of controls belonged to High SES.The odds of developing obesity or overweight among women belonging to high SES was 2.74 times higher than women who belong to low SES(P value-0.047, unadjusted OR 2.74 and 95% CI:1.09-7.63).

5.2.4 Personal history and overweight/obesity

Presence of diabetes hypertension and hyperlipidemia did not show significant association with overweight/obesity (table 5.11).There was no significant association between obesity and sleep less than 6 hours.

able 5:11 Personal history (BMI >=25)

	Cases 112 No (%)	Controls 58 No (%)	P value	OR unadjusted	95% CI	
					Lower	Upper
Diabetes	4(3.6)	2(3.4)	0.967	.1.037	.184	5.837
Hypertension	4(3.3)	1(1.7)	0.499	.2.11	.231	19.334
Hyperlipidemia	14(12.5)	3(5.8)	0.131	2.619	.721	9.514
Duration of sleep<6hours	11(9.8%)	8(13.8%)	0.436	.681	.258	1.799

5.2.5 DIET

Calories, protein, fat and carbohydrate consumed by calculated from 24 hour recall diet survey.

It was shown in our study that women who take more than required calorie /day were3.8 times risk of being overweight as compared to women who take less than required. In this study women who take less than required protein has lower risk of developing obesity /overweight as compared to who takes more than required protein Other dietary factors like intake of more than safe level of fat and diet with more than 80% of energy requirement from carbohydrate did not show significant association with obesity.

Table 5:12 Dietary risk factors and overweight/obesity

Riskfactor	Cases No (%)	Controls No (%)	p value	OR unadjusted	95% CI	
					Lower	Upper
> required Calories	25(22.3)	4(6.9)	0.011*	3.879	1.280	11.756
< recommended protein	49(43.8)	44(75.9)	<0.001*	0.247	0.122	0.502
>safe level of fat	15(13.4)	3(5.2)	0.099	2.835	.786	10.22
>80%of requirement from carbohydrate	18(16.1%)	14(24.1%)	0.202	.602	.275	1.319

*statistically significant

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5.2.6 Physical activity.

Women with inactive physical activity were compared with minimally active/HEPA active women for univariate analysis. Women who were inactive were 43.8% in cases and

34.5% in controls. There was no significant association between physical activity and obesity/overweight in this study population.

Table 5:13 Physical activity and overweight/obesity

Physical activity	Cases-112 No (%)	Controls-58 No (%)	p-value	OR unad-justed	95% CI	
					Lower	Upper
Inactive	49(43.8)	20(34.5%)	0.243	1.478	0.766	2.853
Active	63 (56.2%)	38 (65.5%)				

5.2.7 Common mental disorders and overweight/obesity

Presence of symptoms suggestive of common mental disorder and obesity/overweight was not associated with and overweight/obesity(p-value 0.791).

Table 5:14 Common mental disorders and overweight/obesity

Symptoms suggestive of common mental disorder	Cases No (%)	Controls No (%)	p-value	OR unad-justed	95%Lower (CI)	95%Upper (CI)
Present	37 (33%)	18(31%)	0.791	1.096	.555	2.167
Absent	75 (67%)	40 (69%)				

5.2.8 Obstetrical risk factors and overweight/obesity

5.2.8a Age of menarche, parity and mode of delivery

Women whose parity of greater than 2did not show statistically significant association with overweight/obesity.

Women whose menarche was prior to 13 years also did not show statistically significant association with overweight/obesity .The odds of developing obesity/overweight among women who had LSCS is 2.98 times higher than women who had normal delivery(OR-2.98, 95% CI:0.96-9.22, p- value-.049).

Table 5:15 Age of menarche, parityand overweight/obesity

Risk factor	Cases No (%)	Controls No (%)	p value	OR unadjusted	95% CI Lower	95% (CI) Upper
menarche(<13 age) (Case-112, control 58)	15(13.4)	7(12.1)	0.807	1.13	.43	2.94
Parity (>2) (Case-112, control 58)	28 (27.5)	17 (24%)	0.406	0.73	0.35	1.52
LSCS (Case-102, control 50)	21(20.6)	4(8)	0.049*	2.98	0.96	9.22

*Statistically significant

5:3 Multivariate analysis:

The following variables were chosen from univariate analysis for multivariate analysis namely Socio-economic status, age, hyperlipidemia, taking more than recommended calories, taking less than recommended protein, mode of delivery LSCS, 3 and more parity.

Table 5:16 Multivariate analysis for BMI>25 (*significant)

Risk factor	p value	OR(adjusted)	Lower 95% CI	Upper 95% CI
Age (.36 years)	0.26	1.75	0.715	3.46
SES (high)	0.454	1.372	.600	3.137
Takes >recommended calories	0.389	.608	.195	1.889
Mode of delivery LSCS	0.303	.538	.165	1.75
Take >recommended protein	0.002*	3.67	1.604	8.399
Parity <=2	0.004*	4.993	1.68	14.83
History of hyperlipidemia	0.023*	3.95	1.2	12.902

After adjusting with age and SES, Parity <=2, intake ofmore than recommended protein and history of hyperlipidemia were found to be statistically associated with obesity/overweight .

5.4 Comparison of risk factors among overweight and obese women with normal women.

Association of Risk factors with obesity was studied for dose response by comparing women who were obese with BMI >30 and women with BMI 25-29.9 with reference category with normal BMI <25

Dose response analysis showed positive association between fat intake and obesity other than history of hyperlipidemia ,SES ,parity >=2,mode of delivery more than recommended protein which also showed univariate analysis.

Women who were taking more than 50g of fat have 3.88 higher chance of being obese as compared to women who take less than 50g of fat.

Table 5.17 Dose response analysis –Fat intake and overweight/obesity

BMI	<50gof fat	>50g of fat	p value	Odds ratio	Lower CI 95%	Upper 95%CI
<25 kg/m2	55(94.8%)	3(5.2%)	Reference	reference	Reference	Reference
25-29kg/m2	64(88.9%)	8(11.1%)	.237	2.2	.579	9.063
>30kg/m2	33(82.5%)	7(17.56%)	.04	3.889	1.02	16.084

Risk factors associated with overweight :

After adjusting with age and SES, Parity <=2,(p value .004,adjusted OR- 4.99 CI: 1.68-14.83) intake of more than recommended protein (p value .002, OR-3.67 CI:(1.604-8.39), and history of hyperlipidemia (p value-.023,adjusted OR-3.95.CI:1.2-12.902) were found to be statistically associated with overweight. Women who takes more than 50g of fat (p value-0.04, unadjusted OR-3.8,95%CI:(1.02-16.1)

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6. DISCUSSION

A total of 170 women were recruited in the study. Among them 112 of them were Overweight by WHO definition (cases) and 58 were controls were normal

This study has shown that 73% of obese subjects were in the age group of 35-40 as compared to 27 % between 30-35 years. Even though the association was not statistically significant, there was a rising trend in obesity with increasing age . Misra et al (2)found that there was a increasing trend in the prevalence of obesity with age. Pradeep et al in their study have demonstrated similar findings.

Almost 75% of cases and controls were literate. Eighty two percent of them were literate in cases and 62.1% in the control group. It is less compared to the national urban average of 85%. Nine percent of them were widowed at their young age, 5 of them were due to road traffic accidents and four of them due to Myocardial infarction.

According to Modified Kuppusamy Scale, fifty percentage of the cases and 63.8% of the control group belonged to Upper Lower SES Category..A study done in urban slum 70 % of obese people were belonging to upper lower. (26)

Participants who were diagnosed to have diabetes or hypertension from both cases and controls were taking treatment regularly..One of participants (case) had hypertension , Diabetes and Hyperlipedimia .There was only one participant (case) out of 17 who had hyperlipidemia and was taking treatment. This reflects the attitude and practice of people regarding treatment for hyperlipidemia. They have to be motivated and

educated regarding hyperliidemia, as diseases and its complications which can b prevented

More than 75% of study participants among cases (77.7%) and controls (93.2%) had less than their recommended calorie intake. Nearly two third of both groups were taking less than recommended protein. Among cases, 48.3% were consuming more than maximum level of fat recommended as compared to 29.3% among controls. In this study. 16.1% of cases and 24.1 % of controls were taking more than 80% of energy requirement from carbohydrates. This picture shows that the two sides of spectrum of nutritional disorders under nutrition and over nutrition problem in community.

According to IPAQ classification <2% were highly active. Reason may be due to urbanization, modern technology or lack of awareness. In this study 33% of cases and 31% of controls likely to have some common mental disorder. However, out of these only <2% women diagnosed to have depression and on treatment. It can clearly be seen that there is a very high number of women with undiagnosed depression in community. .This highlights the fact that there is a need to train primary care physician to screen, diagnose and treat depression in community.

5.6% of cases and 7.4% from controls who were married for more than 3 years never became pregnant . Primary infertility is still a big problem in community and has to be addressed from a public health perspective.

Standard duration of exclusive breast feeding was practiced among 57% of cases and 65% of controls. Only 27.5% of mothers from cases group and 40% of control group followed standard duration of breast feeding (2 years) by WHO definition . This picture

clearly demonstrates that ignorance and cultural practices regarding breast feeding is still prevalent in community which shows urgent needs in health education and community participation regarding same.

According to WHO definition 42% of study participants were overweight. A study done by Anuradha et al in urban Chennai also showed (42.7% in 30-39 years of age group).(9) ICMR study done in urban Vellore also showed 55.8% .(26).This study was done in a small age group of the population, which may explain why there is no significant relation noted between obesity and as age increases. women with 10 years of schooling has a higher chance of obesity as compared to less than 10^{th} standard. It may be because less educated women were doing other chores like getting water to houses, manual labor work etc.

The odds of developing obesity or overweight among women who belong to Upper/upper middle class SES was 2.74 times higher than women who belonged to other lower classes of SES(P value-.047.CI :1.09-7.63,unadjusted odds ratio -2.739). This finding is different from sobal et al and Mclaren et al that low SES is related with obesity

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But this significant finding was demonstrated in other studies done in urban Chennai and Kerala by Anuradha et al and Praeep et al. The groups with lower SES were being protected against obesity have usually been explained by following reasons. Most common cause may be food scarcity and patterns of high energy expenditure. It also

should be noted that the greater capacity of the élite to get enough food supplies. Cultural values also will be playing a big role on this like body shape and body images.

Number of people who had history of diabetes, hypertension were very low. That explains why there was no significant association with diabetes and other co.morbidities. One should remember that study was done in young age group.

However this study concluded that the odds of becoming obese was 4.458 times higher (95% CI: 1.2-9.4) amongst women with history of hyperlipidemia as compared to women without history of hyperlipidemia. This finding was consistent with other studies.(49-51)

It was shown in our study those women who had taken more than required calorie /day 3.8 times risk of being obese or overweight as compared to women who had taken less than the required calorie intake. There were many studies that have shown that rich calorie food is one of the most important causes of obesity.(69,70)

But In this study women who took less than required protein had a protective effect on obesity /overweight as compared to those who took more than the required protein. Plantega et also showed that 20% higher protein intake resulted in a 50% lower body weight regain. (80) .But according to studies high protein diet is recommended for obese people. (78).Low SES people will take less protein food as compared to high SES people. So SES may the confounding factor for protein intake..

Women who were taking more than 50g of fat have 3.88 higher chance of being obese as compared to women who take less than 50g of fat. This can be explained by high SES people were taking more processed and fatty foods as compared to low SES people. This finding was consistent with other studies done (75,76)

We couldn't find any association between physical activity and obesity. IPAQ short form can be used for screening for large purposes in population, however it tends to overestimates the physical activities and give false results.(73,74) As this history was asked with a recall period of one week, it will not give clear picture of physical activities which the participants follow on a daily basis for long duration.

Even though validated questionnaires were used in this study, an association between common mental disorders and obesity could not be made. 35% of both cases and controls had common mental disorder in this study . Both overeating or undereating are signs of depression,.(78,81) This may explains why there was no statistical association between depression and obesity.

. Women who had 3 and more children were found to have less risk of developing obesity(WHO definition of overweight) as compared to parity 2 and less(OR-.28 CI:.101-774,P value .01).But other studies demonstrated positive association with obesity with an increase in parity. This may be due to there being less number no of women who had children more than 3 and less than 2 .Majority

of women(around 65%) two children. Woman who has more than 2 children may have to run around to take care of children

The odds of developing obesity/overweight amongst women who had LSCS was 2.98 times higher than women who had normal delivery.(OR-2.98 CI:.964-9.219,P value-.049). This finding has been clearly demonstrated in other studies (.90) Women who had LSCS were reluctant to work for first 3 months and did not lift heavy objects as compared to women who had normal delivery.

From this study important risk factors identified were history of undergoing Caesarian section belonging to upper middle/upper socioeconomic class, , Parity <= 2 and history of Hyperlipidemia. It is concluded that findings from the study are relevant for any intervention towards reducing the burden of overweight and obesity. This study also brings out the importance of public health action against obesity which will further lead to many metabolic complication that can be prevented. Housewives are important group in family and society which has to be screened educated and treated for obesity and its related problems

7. SUMMARY AND CONCLUSION

Obesity and overweight are global epidemics (1) The WHO has described obesity as the most neglected public health problems, affecting every region of the globe . The burden of over-weight and obesity in the developing country is as high with higher prevalence in urban areas. As the women are more likely to be overweight/obese and carry with them the burden of additional diseases, this study tried to determine its association with socioeconomic and other factors.

The most important finding in this study was the change in weight of the participants in the period between 2012 and current study. Many women with normal BMI had become over-weight or obese. This resulted in fewer controls in the study. However, the findings from the study are relevant for any intervention towards reducing the burden of overweight and obesity.

Diet and physical activity is a known modifiable risk factor for obesity and overweight. This study found that most of the participants consume less food than recommended for them. However, persons consuming more than recommended protein and fat were more likely to be overweight/obese. Other important risk factors were belonging to upper middle/upper socioeconomic class, history of undergoing Caesarian section, Parity <= 2 and ever being diagnosed with Hyperlipidemia.

8. LIMITATIONS:

Of the total sample size of 170, 112 were cases and 58 of them were controls. This was not surprising, given that even in 2012 60% of the urban women were overweight and this proportion has probably increased, making it difficult to get controls with BMI < 25 kg/m^2 .Therefore the lower number of controls could account for the wider confidence intervals. The investigator had been blinded to case or control status and at the end of the study was unable to collect data from more controls when the imbalance in numbers of both groups was revealed

Lack of adequately documented antenatal records for checking gestational weight gain weakened this analysis. During the 24 hour recall dietary survey actual preparation of the item was not asked. Low caloric intake even by the obese women could indicate recall bias as well. The IPAQ questionnaire has probably overestimated physical activity as has been known to occur.

9. RECOMMENDATIONS

- Health education regarding causes, impact, treatment and prevention of obesity which is an emerging problem among young adults is needed urgently. Avoidance of high fat and calorie dense food and adherence to exercise needs to be promoted to reduce obesity.
- Housewives who are financially dependent need to be able to access health care and public health actions should reach them, including information on non-communicable disease prevention.
- All social classes, rich and poor need reliable information on obesity prevention
- The relationship of gestational weight gain and obstetric factors needs to be studied through prospective studies
- Overall there is an urgent need to include obesity prevention on the public health agenda in developing countries. It is necessary to design and implement public health actions on the physical, sociocultural, environmental and economic factors that make healthier choices concerning diet and physical activity feasible for all.

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Annexures

1. IRB approval
2. Information sheet
3. Valid informed consent
4. Study proforma
5. IPAQ scoring guidelines

Dr. B.J. Prashantham, M.A., M.A., Dr. Min (Clinical)
Director, Christian Counseling Center,
Chairperson, Ethics Committee.

Dr. Alfred Job Daniel, D Ortho, MS Ortho, DNB Ortho
Chairperson, Research Committee & Principal

Dr. Nihal Thomas,
MD., MNAMS., DNB (Endo), FRACP (Endo), FRCP (Edin), FRCP (Glasg)
Deputy Chairperson
Secretary, Ethics Committee, IRB
Additional Vice Principal (Research)

Mrs. Emily Daniel	MSc Nursing	Professor, Medical Surgical Nursing	Internal, Nurse
Mr. C. Sampath	BSc, BL	Legal Expert, Vellore	External, Legal Expert
Rev. Joseph Devaraj	B. Sc, BD	Chaplaincy Department, CMC	Internal, Social Scientist
Dr. Nihal Thomas	MD, MNAMS, DNB(Endo), FRACP(Endo) FRCP(Edin) FRCP (Glasg)	Professor & Head, Endocrinology. Additional Vice Principal (Research), Deputy Chairperson, IRB, Member Secretary (Ethics Committee),IRB	Internal, Clinician

We approve the project to be conducted as presented.

The Institutional Ethics Committee expects to be informed about the progress of the project, any **adverse events** occurring in the course of the project, any **amendments in the protocol and the patient information / informed consent**. On completion of the study you are expected to submit a copy of the **final report**. Respective forms can be downloaded from the following link: http://172.16.11.136/Research/IRB_Polices.html in the CMC Intranet and in the CMC website link address: http://www.cmch-vellore.edu/static/research/Index.html.

Fluid Grant Allocation:

A sum of 17, 150/- INR (Rupees Seventeen Thousand One Hundred and Fifty only) will be granted for 9 months.

Yours sincerely

B.J. Prashantham

Dr. B. J. Prashantham
Chairperson (Ethics Committee)
Institutional Review Board

Cc: Dr. Shantidani Minz, Community Medicine, CMC, Vellore.

IRB Min No: 9237 [OBSERVE] dated 12.01.2015

Ethics Committee Blue, Office of Research, 1st Floor, Carman Block, Christian Medical College, Vellore, Tamil Nadu 632 002.
Tel : 0416 - 2284294, 2284202 Fax : 0416 - 2262788, 2284481 E-mail : research@cmcvellore.ac.in

Consent form

Study title: To study risk factors of Obesity and overweight among urban women

Date: Study number:

Name of the study participant:

Father/husband:

Age: Ward:

- I have read the information sheet / I have been informed by the investigator about the objectives of this study. I understand that this study is being carried out to find out the association of certain specific riskfactors with overweight and obesity.
- I understand that my participation in this study is purely voluntary. My unwillingness to participate or decision to withdraw will not affect my (or family's) current or future care with any of the programmes in the investigator's institution.
- I understand that my privacy will be maintained and all information given by me will be kept confidential and be used without identifying me for the purpose of the study only. However summary results for this study may be shared for publication purposes.
- I understand that the investigator and the other researchers will not need my permission to look at my study information both in the current study and any further research that may be conducted in relation to it. I agree to this access. However, I understand that my identity will not be revealed in any investigation released to third party investigator or if this study is published.
- I confirm that I have read (or have read to me in my own language)and understood the information sheet for the above study and have had the opportunity to ask questions.

Signature /thumb impression of the participant: ----------

Signature of a witness:-1. ----------

Signature of the investigator: ----------

If you have any questions about this research study, please contact Dr.Beeson: 944360371

Patient information sheet

The following information is provided to inform you about this research project and your participation in it. Please read this form carefully and please feel free to ask any questions you may have about the study or the information given below. You will be given an opportunity to ask questions, and your questions will be answered. Also, you will be given a copy of this information sheet.

Your participation in this research study is voluntary. You are also free to withdraw from this study at any time after it starts.

Purpose of the study:

Obesity causes a lot of medical problems and we have seen that women are more likely to face this problem than men. A previous study in Vellore has shown that half of the women aged 30 to 40 in Vellore have weight that is higher than what is recommended. This study is being done to find out risk factors forobesity and overweight in this age group of women.

Methods to be followed

We have previously conducted a study in 2012 in which we have measured height and weight in addition to other tests. Some people were found to have abnormal weight for their height and others were normal. We have selected around 300 women, half of which have normal weight and the other half having abnormal weight. Nowwe are asking yousome additional questions regarding diet, activity, socio-economic situation and history regarding childbirth. This will help us find out why some women aged 30 to 40 years gain weight more than others so that we can plan interventions to decrease this problem of overweight.

After asking you questions we will recheck your height and weight as these may have changed since 2012.

Approximate duration of study

Five months (January 2015 to September 2015) during which you will be interviewed once

Expected cost to participant None

Descriptions of the discomforts, inconveniences, and/or risk factorsthat can be reasonably expected as a result of participation in the study:

The questionnaire and examination will require around 20 minutes of your time. You are being interviewed at your home in order to avoid any inconvenience.

Anticipated benefits from this study:

The main purpose of the study is to findcauses of overweight and obesity. As we interview you we will be able to identify required information. This study and the interview we conduct is also a mutual exchange of knowledge where your awareness about obesity and overweight will increase.After measuring your height and weight you will be told if it is normal or not. If your weight is high then you will be provided a diet sheet to help you lose weight.

Compensation for participation:

We will not be giving money to answer questions or be a part of this study.

Circumstances under which the principal investigator may withdraw you from the study participation:

If you wish not to answer questions or do not want us to contact or meet regarding this particular study we can withdraw you from this study. If you withdraw, this will not stop us from providing medical care for you or your family.

What happens if you choose to withdraw from the study participation?

The information you give us will not be used by us. All collected information will be destroyed.

Confidentiality:

All efforts, within reason, will be made to keep your personal information in the research record confidential. It will not be shared with anyone else.

Privacy

Your identity will not be revealed to anyone else; however summary data of the study will be shared with Institutional Review Board of Christian medical college and used for publication for scientific purpose.

Contact information:

If you have any questions about this research study or possibly, please feel free to contact:

Dr.Beeson-9443603710

Study questionnaire

Study ID

1-Name

2-Marital status: Single/married/divorced or separated/widow

3-Husband's/father's name

4-Mobile No:

5-Age

6-Place

7-Address:

8-Occupation

9-Religion

10-Caste

11-Education:

12-Literacy

SES(Kuppusamy 2012)

13-Occupation of head of household

14-Education of head of house hold

15-Total family income (monthly)

Personal history:

16- Have you ever been diagnosed to have diabetes: yes/no

17-Have you ever been diagnosed to have hypertension: yes/no

18-Other disease:

19-Treatment of Depression:

20- List of current medications:

1

2

3

4

5

6

21-On an average how long do you sleep at night? ----------hours

Reproductive history:

22-Age at menarche

23-Obstetrical score: G P L A

24-Antenatal card available: Yes/No

25-If yes: first trimester weight (≤ 12 weeks) ---------- (last trimester weight, ≥ 36 weeks)

26-When was your last delivery? Years----------months----------

27-Mode of delivery (last pregnancy):

28-What was the change in your activity level after the last delivery? Circle the correct response

No changes at all/do less physical works/ do more physical work

29-How long did you breast feed your youngest child? Circle the correct response

Not at all/----------duration in days/months

30-How long did you practice exclusive breastfeeding for your youngest child?

----------days/months

31-**DIET 24 hour recall**

Time	**Food**	**quantity**
Early morning		
Breakfast		
Mid morning		
Lunch		
Tea time		
Dinner		
In between snacks		
Bed time		

-Depression: Patient health questionnaire 12

HAVE YOU RECENTLY:-	**A**	**B**	**C**	**D**
32-been able to concentrate on Whatever you are doing?	Better than usual	Same as usual	Less than usual	Much less than usual
33-lost much sleep over worry?	Not at all	No more than usual	Rather more than usual	Much more than usual
34-felt that you are playing a useful part in things?	More so than usual	Same as usual	Less useful than usual	Much less than usual
35-felt capable of making decisions about things?	More so than usual	Same as usual	Less so than usual	Much less capable
36-felt constantly under strain?	Not at all	No more than usual	Rather more than usual	Much more than usual
37-felt you couldn't over come your difficulties?	Not at all	No more than usual	Rather more than usual	Much more than usual
38-been able to enjoy your normal day-to-day activities?	More so than usual	Same as usual	Less so than usual	Much less than usual
39-been able to face up to your problems?	More so than usual	Same as usual	Less able than usual	Much less able

40-been feeling unhappy and depressed?	Not at all	No more than usual	Rather more than usual	Much more than usual
41-been losing confidence in yourself?	Not at all	No more than usual	Rather more than usual	Much more than usual
42-been thinking of yourself as a worthless person?	Not at all	No more than usual	Rather more than usual	Much more than usual
43-been feeling reasonably lesshappy, all things considered?	More so than usual	About same as usual	Less so than usual	Much than usual

-**Exercise :IPAQ** Think about all the **vigorous** activities that you did in the **last 7 days**. **Vigorous** physical activities refer to activities that take hard physical effort and make you breathe much harder than normal. Think *only* about those physical activities that you did for at least 10 minutes at a time.

44-During the **last 7 days**, on how many days did you do **vigorous** physical activities like heavy lifting, digging, aerobics, or fast bicycling?

_____ **days per week**

No vigorous physical activities → ***Skip to question 55***

45-How much time did you usually spend doing **vigorous** physical activities on one of those days?

_____ **hours per day** _____ **minutes per day** Don't know/Not sure

Think about all the **moderate** activities that you did in the **last 7 days**. **Moderate** activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal. Think only about those physical activities that you did for at least 10 minutes at a time.

46-During the **last 7 days**, on how many days did you do **moderate** physical activities like carrying light loads, bicycling at a regular pace, or doubles tennis? Do not include walking.

_____ **days per week**No moderate physical activities If no ***Skip to question 56***

47-. How much time did you usually spend doing **moderate** physical activities on one of those days?

_____ **hours per day** _____**minutes per day**Don't know/Not sure

Think about the time you spent **walking** in the **last 7 days**. This includes at work and at home, walking to travel from place to place, and any other walking that you have done solely for recreation, sport, exercise, or leisure.

48. During the **last 7 days**, on how many days did you **walk** for at least 10 minutes at a time? _____ **days per week** IF No walking***Skip to question 58***

49-How much time did you usually spend **walking** on one of those days?

_____ **hours per day** _____ **minutes per day** Don't know/Not sure

The last question is about the time you spent **sitting** on weekdays during the **last 7 days**. Include time spent at work, at home, while doing course work and during leisure time. This may include time spent sitting at a desk, visiting friends, reading, or sitting or lying down to watch television.

50-During the **last 7 days**, how much time did you spend **sitting** on a **week day**?

_____ **hours per day** _____ **minutes per day** Don't know/Not sure

51-Weight: kg 52-Height cm

53- BMI- ---------- Overweight,Obesity,normal,underweight

ஒப்புதல் படிவம்

ஆய்வுத் தலைப்பு : நகர்வாழ் பெண்களிடையே காணப்படும் உடற்பருமன் மற்றம் அதிக எடைக்கான காரணங்களைப் பற்றிய ஆய்வு

தேதி : ஆய்வு எண் :

ஆய்வில் பங்கேற்பவரின் பெயர் :

தந்தை / கணவர் :

வயது : வார்டு :

நான் தகவல் படிவத்தைப் படித்துள்ளேன் / ஆய்வாளர் இந்த ஆய்வின் நோக்கங்களை எனக்கு கூறினார். உடற்பருமன் மற்றும் அதிக எடைக்கு தொடர்புடைய குறிப்பிட்ட சில காரணங்களைப் பற்றி ஆய்வு மேற்கொள்ளப்படுகிறது என்பதை புரிந்து கொண்டேன்.

இந்த ஆய்வில் எனது பங்கேற்பு முற்றிலும் எனது சுய விருப்பத்தைச் சார்ந்துள்ளது என்பதை புரிந்து கொண்டேன். இந்த ஆய்வில் பங்கேற்க அல்லது தொடர்ந்து நான் மறுத்தால் அது ஆய்வாளரின் நிறுவனத்தில் நான் (அல்லது எனது குடும்பம்) தற்சமயம் பெறுகின்ற அல்லது எதிர்காலத்தில் பெற போகும் சேவைகளைப் பாதிக்காது.

எனது தனிப்பட்ட அடையாளம் பாதுகாக்கப்படும் என்பதையும், நான் அளிக்கும் தகவல்கள் இரகசியமாக வைக்கப்படும் என்பதையும், என்னை அடையாளப்படுத்தாமல் ஆய்வுக் காரணங்களுக்காக மட்டும் அவை பயன்படுத்தப்படும் என்பதையும் புரிந்து கொண்டேன்.

இந்த ஆய்வுக்காக அல்லது இதற்கு தொடர்புடைய வேறு ஆய்வுகளுக்காக நான் அளிக்கும் தகவல்களை எனது அனுமதியின்றி பார்க்கலாம் என்பதை புரிந்து கொண்டேன். இதற்கு நான் சம்மதிக்கிறேன். ஆனால், இந்த ஆய்வு வெளியிடப்படும் போதும், மூன்றாம் நபருக்கு தகவல்களை அளிக்கும் போதும் எனது அடையாளம் தெரிவிக்கப்படமாட்டாது என்பதையும் புரிந்து கொண்டேன்.

நான் இந்த தகவல் படிவத்தைப் படித்தேன் (அல்லது எனது சொந்த மொழியில் எனக்கு படித்துக் காட்டப்பட்டது) என்பதையும், இந்த தகவல் படிவத்தை நான் புரிந்து கொண்டேன் என்பதையும், கேள்விகள் கேட்பதற்கு எனக்கு வாய்ப்பு அளிக்கப்பட்டது என்பதையும் உறுதி செய்கிறேன்.

பங்கேற்பவரின் கையொப்பம் / பெருவிரல் கை ரேகை : _____

சாட்சியின் கையொப்பம் : _____

ஆய்வாளரின் கையொப்பம் : _____

இந்த ஆய்வு குறித்து உங்களுக்கு ஏதேனும் கேள்விகள் இருந்தால், மருத்துவர் பீசன் அவர்களை 944360371 என்ற அலைபேசி எண்ணில் தொடர்பு கொள்ளவும்.

நோயாளி தகவல் படிவம்

இந்த ஆய்வு பற்றியும் அதில் தங்களின் பங்களிப்பு பற்றி தெரிவிப்பதற்கோ இந்த பின்வரும் தகவல் தங்களிடம் அளிக்கப்பட்டுள்ளது. இப்படிவத்தினை கவனமாக படித்து, இந்த ஆய்வைப்பற்றியோ அல்லது கீழே கொடுக்கப்பட்டுள்ள தகவல் பற்றியோ ஏதேனும் கேள்விகள் இருந்தால் தயங்காமல் கேட்கலாம். கேள்வி கேட்பதற்கு வாய்ப்பு அளிக்கப்படும். தங்களின் கேள்விகளுக்கு விடை அளிக்கப்படும். இந்த படிவத்தின் நகல் தங்களிடம் ஒன்று அளிக்கப்படும்.

இந்த ஆய்வில் தங்களின் பங்களிப்பு தன்னிச்சையானது தாங்கள் விலகிக் கொள்ள விரும்பினால் எந்நேரமும் இந்த ஆய்வில் இருந்து விலகிக் கொள்ளலாம்.

ஆய்வின் நோக்கம்

உடல் பருமன் ஆனது பல மருத்து பிரச்சனைகளுக்கு காரணமாக உள்ளது. அதில் நாம் பார்க்கப்போனால் ஆண்களைவ ிட பெண்களுக்கு இப்பிரச்சனையை அதிகமாக எதிர்கொள்கின்றனர்.

முன்னதாக வேலூர் நகரில் எடுக்கப்பட்ட ஆய்வில், 30 முதல் 40 வயதுக்கு உட்பட்ட பெண்கள் அறிவுறுத்தப்பட்ட எடையை விட அதிகமாக இருப்பது கண்டறியப்பட்டுள்ளது.

குறிப்பாக பெண்களிடத்தில் இந்த உடல் பருமன் மற்றும் அதிக எடை அதற்கான ஆபத்து காரணிகளை கண்டறிவதற்கே இந்த ஆய்வு நடத்தப்படுகிறது.

பின்பற்ற வேண்டிய வழிமுறைகள்:

முன்னதாக 2012ம் ஆண்டு ஒரு ஆய்வு நடத்தப்பட்டபோது அதில் நாங்கள் உயரம், எடை மற்றும் இதர பரிசோதனைகளை அளந்து பார்த்தோம்.

அதில் சில மக்கள் தங்கள் உயரத்திற்கு மாறாக அதிக எடை கொண்டவர்களாக காணப்பட்டார்கள் மற்றும் சிலர் சரியாக இருந்தார்கள்.

சரியான எடை கொண்ட அரை விழுக்காடு பெண்கள் மற்றும் அதிக எடை கொண்ட அரை விழுக்காடு பெண்கள் ஆக 300 பெண்களை தேர்வு செய்தோம்.

இப்பொழுது உணவு கட்டுப்பாடு, செயல்கள், சமூக பொருளாதார சூழ்நிலை மற்றும் குழந்தை பிறப்பு பற்றிய வரலாறு பற்றி சில மற்ற கேள்விகளை கேட்கிறோம்.

30 முதல் 40 வயது உள்ள பெண்கள் மற்றவர்களைவிட ஏன் எடை கூடுகிறார்கள் அதன் காரணம் என்ன, மற்றும் இந்த எடை அதிகரிப்பு பிரச்சணையை குறைப்பதற்கான செயல்முறை திட்டம் என்ன என்பதையும் கண்டறிவதற்கே இந்த கேள்விகள் உதவும்.

கேள்விகள் கேட்ட பிறகு நாங்கள் தங்களின் உயரம் மற்றும் எடையை மறுபடி அளந்து பார்ப்போம் ஏனெனில், 2012-ல் எடுக்கப்பட்டது மாற வாய்ப்பு உள்ளது.

ஆய்வின் காலம்

ஐந்து மாதங்கள் (ஜனவரி 2015 - செப்டம்பர் 2015) இந்த கால அளவில் தங்களிடம் ஒருமுறை நேர்காணம் நடத்தப்படும் பங்கேற்பாளருக்கு எதிர்பார்க்கப்படும் தொகை : இல்லை.

ஆய்வில் பங்கேற்பதன் மூலம் எதிர்பார்க்கப்படும் அசௌகரியங்கள் மற்றும் ஆபந்து காரணிகளின் விவரம்:

கேள்வித்தாள் மற்றும் பரிசோதனை மூலம் தங்களின் நேரத்திலிருந்து 20 நிமிடங்கள் எடுத்துக்கொள்ளப்படும். அசௌகரியங்களை தவிர்க்க நேர்காணம் தங்கள் வீட்டில் நடைபெறும்.

ஆய்வின் மூலம் எதிர்பார்க்கப்படும் பயன்கள்

இந்த ஆய்வின் முக்கய நோக்கமானது, உடல் பருமன் மற்றும் அதிக எடையின் காரணத்தைக் கண்டறிதல் ஆகும்.

நேர்காணல் நடத்தும்போது எங்களுக்கு தேவையான தகவலை கண்டறிய முடியும்.

இந்த ஆய்வு மற்றும் நாங்கள் நடத்தும் நேர்கானல், அறிவு பரிமாற்றத்தின் ஒரு முக்கிய அங்கமாகும். இதில் உடல் பருமன் மற்றும் அதிக எடை சம்மந்தப்பட்ட விழிப்புணர்வு அதிகரிக்கும்.

தங்களின் உயரம் மற்றும் எடை அளந்த பிறகு அவை சரியாக உள்ளதா? இல்லையா? என்று தெரிவிக்கப்படம்.

அதில் எடை அதிகமாக இருந்தால், நீங்கள் எடை குறைக்க தங்களிடம் உணவு கட்டுப்பாடு அட்டவனை ஒன்று தரப்படும்.

பங்கேற்பதற்கு நிவாரணம்

ஆய்வில் பங்கேற்பதற்கோ (அ) கேள்விகளுக்கு பதில் அளிப்பதற்கோ எந்த விதமான பணமோ தரப்படமாட்டாது.

தலைமை ஆய்வாளர் தங்களை ஆய்வில் இருந்து விவக்கிக் கொள்ள நேரும் சூழ்நிலைகள் தாங்கள் கேள்விகளுக்கு பதில் அளிக்க மறுத்தாலோ (அ) நாங்கள் தாங்களை தொடர்பு கொள்ள மறுத்தாலோ (அ) இந்த ஆய்வு சம்மந்தமாக எங்களை சந்திக்க மறுத்தாலோ இந்த ஆய்வில் இருந்து தாங்களை விலக்கிக் கொள்வோம்.

இந்த ஆய்வில் இருந்து விலக்குவதால் எந்த ஒரு மருத்துவ பராமரிப்பும் தங்களுக்கும் (அ) தங்கள் குடும்பத்துக்கும் நிறுத்தப்படமாட்டாது.

நீங்கள் பங்கேற்பதிலிருந்து விலகினால் என்ன நடக்கும்?

நீங்கள் அளிக்கும் தகவல் எங்களால் உபயோகிக்கப்படமாட்டாது. சேகரிக்கப்பட்ட எல்லா தகவல்களும் அழிக்கப்படும்.

இரகசியத் தன்மை

தங்களின் தனிப்பட்ட விவரங்கள் அனைத்தும் ஆய்வு பதிவேட்டில் இரகசியமாக வைக்க எல்லா முயற்சியும் எடுக்கப்படும். மற்றவர் எவரிடமும் இவை பகிர்ந்து கொள்ளப்படமாட்டாது.

தனித்தன்மை

தங்களின் அடையாளம் எவரிடமும் தெரிவிக்கப்படமாட்டாது. மேலும், இந்த ஆய்வில் சேகரிக்கப்பட்ட தகவல்கள், கிருத்துவ மருத்துவ கல்லூரி, நிர்வாகத்திடம் அறிவியல் பதிப்புக்காக மட்டும் பகிர்ந்து கொள்ளப்படும்.

தொடர்பு கொள்க.

இந்த ஆய்வு சம்மந்தமாக ஏதேனும் கேள்விகள் இருந்தால், தயங்காமல் தொடர்பு கொள்க.

Dr. பீசன் : 9443603710

ஆய்வு அடையாளம்

1. பெயர் :
2. திருமண அந்தஸ்து : திருமணம்/ ஆனவர் / விவாகரத்து ஆனவர்
   (அ) பிரிந்து வாழ்பவர் / விதவை
3. கணவர் / தகப்பனார் பெயர் :
4. தொலைபேசி எண் :
5. வயது :
6. இடம் :
7. விலாசம் :
8. தொழில் :
9. மதம் :
10. சாதி :
11. கல்வி :
12. கல்வித் தகுதி :
    சமூக பொருளாதார நிலை :
13. குடும்பத் தலைவரின் தொழில் :
14. குடும்பத் தலைவரின் கல்வி :
15. மொத்த குடும்ப வருமானம் : (மாதம்)
    தனிநபர் வரலாறு
16. சர்க்கரை நோய் உள்ளதாக நீங்கள் எப்பொழுதாவது கண்டறியப்பட்டுள்ளீரா? ஆம் / இல்லை
17. இரத்த கொழுப்பு உள்ளதாக நீங்கள் எப்பொழுதாவது கண்டறியப்பட்டுள்ளீரா? : ஆம் / இல்லை
18. மற்ற வியாதி :
19. மன அழுத்தத்திற்கான சிகிச்சை :
20. தற்போதைய மருந்துகளின் பட்டியல் :
21. சராசரியாக இரவில் எவ்வளவு நேரம் உறங்குவீர்கள்? _____ மணி
22. பருவம் அடைந்த வயது :
23. கற்பகால அட்டை உள்ளதா? : ஆம் / இல்லை
24. ஆம் என்றால் : முதல் _____ எடை (≤ 12 வாரம்) _____
    (கடைசி _____ எடை ≥ 36 வாரங்கள்)
25. கடைசி பிரசவம் எப்பொழுது? வருடம் _____ மாதம் _____
26. பிரசவத்தின் வகை (கடைசி பிரசவம்)
27. கடைசி பிரசவத்திற்கு பிறகு உங்களுடைய செயல்பாடுகளில் உள்ள மாற்றம் என்ன?
    சரியான பதிலை சுருட்டி விடுக:-
    மாற்றம் எதுவும் இல்லை

28. உங்கள் கடைசி குழந்தைக்கு எவ்வளவு நேரம் தாய்ப்பால் கொடுத்தீர்கள்?

இல்லவே இல்லை / _____ நாள் / மாத கணக்கில்

29. உங்கள் கடைசி குழந்தைக்கு எவ்வளவு நேரம் தாய் பால் கொடுப்பதை உரிய வழக்கமாக கொண்டு இருந்தீர்கள்?

_____ நாள் / மாதங்கள்

31. உணவு கட்டுப்பாடு 24 மணி நேர

நேரம்	உணவு	அளவு
அதிகாலை		
காலை உணவு		
நடு ஜாமம்		
மதிய உணவு		
தேநீர் நேரம்		
இரவு உணவு		
நொருக்குத் தீனி		
படுக்கை நேரம்		

32. சமீபகாலமாக தாங்கள் செய்யும் வேலைகளில் தங்களால் அதிகம் கவனம் செலுத்த முடிகிறதா?
   a. வழக்கத்தைவிட நன்றாக
   b. வழக்கம் போலவே
   c. வழகத்தைவிட குறைவாக
   d. வழக்கத்தைவிட மிகவும் குறைவாக

33. சமீபகாலமாக கவலையால் தூக்கத்தை இழந்துவிட்டீர்களா?
   a. இல்லை
   b. வழக்கத்தைவிட அதிகமாக இல்லை
   c. வழக்கத்தைவிட மிக அதிகமாக
   d. வழக்கத்தைவிட மிக மிக அதிகமாக

34. சமீபகாலமாக தாங்கள் வாழ்க்கையில் உபயோகமான வேலைகளில் ஈடுபட்டு வருவதாக உணர்கிறீர்களா?
   a. வழக்கத்தைவிட நன்றாக
   b. வழக்கம் போலவே
   c. வழக்கத்தைவிட குறைவாக
   d. வழக்கத்தைவிட மிகவும் குறைவாக

35. சமீப காலமாக வாழ்க்கையில் / செயல்களில் முடிவு எடுக்கும் திறமை இருக்கிறதா?
   a. வழக்கத்தை விட நன்றாக
   b. வழக்கம் போலவே
   c. வழக்கத்தைவிட குறைவாக
   d. வழக்கத்தைவிட மிகவும் குறைவாக

36. சமீபகாலமாக எப்போதும் மன அழுத்தத்தில் உள்ளதாக உணர்கிறீர்களா?
    a. இல்லை
    b. வழக்கத்தைவிட அதிகமாக இல்லை
    c. வழக்கத்தைவிட மிக அதிகமாக
    d. வழக்கத்தைவிட மிக மிக அதிகமாக

37. சமீபகாலமாக தாங்கள் பிரச்சனைகளல் இருந்து மீள முடியாமல் இருப்பதாக
    a. இல்லை
    b. வழக்கத்தைவிட அதிகமாக இல்லை
    c. வழக்கத்தைவிட மிக அதிகமாக
    d. வழக்கத்தைவிட மிக மிக அதிகமாக

38. சமீபகாலமாக தங்களின் அன்றாட நடவடிக்கைகளை அனுபவித்து உணர முடிகிறதா?
    a. வழக்கத்தைவிட அதிகமாக
    b. வழக்கம் போலவே
    c. வழக்கத்ததைவிட குறைவாக
    d. வழக்கத்தைவிட மிகவும் குறைவாக

39. சமீபகாலமாக தங்களால் பிரச்சனைகளை எதிர்கொள்ள முடிகிறதா?
    a. வழக்கத்தைவிட அதிகமாக
    b. வழக்கம் போலவே
    c. வழக்கத்தைவிட குறைவாக
    d. வழக்கத்தைவிட மிக மிக குறைவாக

40. சமீப காலமாக தாங்கள் மன அழுத்தம் அல்லது / மகிழ்ச்சியின்மையில் இருந்து வருகிறீர்களா?
    a. இல்லை
    b. வழக்கத்தைவிட அதிகமாக இல்லை
    c. வழக்கத்தைவிட மிக அதிகமாக
    d. வழக்கத்தைவிட மிக மிக அதிகமாக

41. சமீப காலமாக தாங்கள் நம்பிக்கை இழந்து வருகிறீர்களா?
    a. இல்லை
    b. வழக்கத்தைவிட அதிகமாக இல்லை
    c. வழக்கத்தைவிட அதிகமாக
    d. வழக்கத்தைவிட மிக மிக அதிகமாக

42. சமீபகாலமாக தாங்கள் ஒரு லாயக்கற்ற/மதிப்பற்ற நபராக தங்களை எண்ணுகிறீர்களா?
    a. இல்லை
    b. வழக்கத்தைவிட அதிகமாக இல்லை
    c. வழக்கத்தைவிட அதிகமாக
    d. வழக்கத்தைவிட மிக மிக அதிகமாக

43. சமீபகாலமாக பொதுவாக எல்லாவற்றிலும் போதுமான அளவு மகிழ்ச்சியுடன் இருப்பதாக உணர்கிறீர்களா?
    a. வழக்கத்தைவிட அதிகம்
    b. வழக்கம் போலவே
    c. வழக்கத்தைவிட குறைவாக
    d. வழக்கத்தைவிட மிகவும் குறைவாக

மனச் சோர்வு : நோயாளி ஆரோக்கியத்தின் கேள்வித்தாள் 12

உடற்பயிற்சி : IPAQ கடந்த ஏழு நாட்களில் நீங்கள் செய்த பயங்கரமான செயல்பாடுகள் குறித்து சிந்தித்து பாருங்கள் பயங்கரமான உடற் செயற்பாடுகள் என்பது கடினமாக மூச்சு இறைப்பு ஏற்பட்டு, உடலை கடினமாக முயற்சி செய்து செய்யக்கூடிய வேலைகள் ஆகும். குறைந்தபட்சம் பத்து நிமிடம் ஆவது இப்படிப்பட்ட உடல் செயல்பாடுகள் தாங்கள் செய்தவற்றை நினைத்து பாருங்கள்.

44. நீங்கள் கடந்த ஏழு நாட்களில், எத்தனை நாட்கள் இப்படிப்பட்ட பயங்கரமான உடற்செயல்களை உதாரணமாக பாரம் தூக்குதல், தோண்டுதல், உடல் பயிற்சி (அ) வேகமாக மதிவண்டி மிதித்தல் செய்தீர்கள்.
    _____ நாட்கள் / வார கணக்கில்

பயங்கர கடினமான உடல் செயல்பாடுகள் எதுவுமில்லை / கேள்வி 05க்கு செல்லுக.

45. அந்த ஒரு நாட்களில், கடினமான உடல் செயல்பாடுகள் செய்ய தாங்கள் சாதாரனமாக எவ்வளவு நேரம் செலவழிப்பீர்கள்
    _____ நேரம் / ஒரு நாளில் _____ மணி துளிகள் / ஒரு நாளில்

கடந்த ஏழு நாட்களில் மிதமாக செய்த வேலைகளை பற்றி யோசித்து பாருங்கள் மிதமான வேலைப்பாடுகள் என்பது மிதமான உடல் உழைப்பு மற்றும் சாதாரண மூச்சை விட சற்று கடினமாக மூச்சு விடுதல் ஆகும்.

ஒரு நேரத்தில் குறைந்தபட்சம் பத்து நிமிடங்களாவது இப்படிப்பட்ட மிதமான செயல்பாடுகள் செய்தவற்றை பற்றி யோசித்து பாருங்கள்.

46. கடந்த ஏழு நாட்களில், மிதமான உடற் செயற்பாடுகள் உதாரணமாக லேசான பாரங்களை தூக்குதல், தினமும் மிதிவண்டி மிதித்தல் (அ) இரட்டையர் டென்னிஸ் விளையாட்டு? நடத்தலை சேர்க்க வேண்டாம்.

_____ நாட்கள் / ஒரு வாரத்தில், மிதமான உடல் செயல்பாடுகள் ஏதுமில்லை. இல்லையென்றால் கேள்வி 56-க்கு செல்லவும்.

47. அந்த ஒரு நாட்களில், மிதமான உடற் செயற்பாடுகள் செய்ய சாதாரணமாக எவ்வளவு நேரம் எடுத்து கொண்டீர்கள்?

_____ நேரம் / ஒரு நாளில் _____ மணித்துளி / ஒரு நாளில் தெரியவில்லை / உறுதியாக தெரியவில்லை.

கடந்த ஏழு நாட்களில், நடப்பதற்காக செலவிடப்பட்ட நேரத்தை பற்றி யோசித்து பாருங்கள். இவை, அலுவலகத்தில், வீட்டில், இடம் பெயர்வதற்காக நடத்தல் மற்றும் மற்ற நடைகள் உதாரணமாக ஓய்வு எடுப்பதற்காக தனியாக நடத்தல், விளையாட்டு உடற்பயிற்சி (அ) ஓய்வு நேரம் போன்றவற்றை ஆகும்.

48. கடந்த ஏழு நாட்களில் ஒரே நேரத்தில் குறைந்தபட்சம் பத்து நிமிடமாவது எத்தனை நாட்கள் நடந்தீர்கள்?

_____ நாங்கள் / ஒரு வாரத்தில்

நட இல்லை என்றால் கேள்வி 58 செல்லுக.

49. அந்த ஒரு நாளில், சாதாரணமாக "நடைக்காக" எத்தனை நேரம் செலவழித்தீர்கள்?

_____ நேரம் / ஒரு நாளில் _____ மணித் துளி / ஒரு நாளில் தெரியவில்லை / உறுதியாக தெரியவில்லை

இந்த கடைசி கேள்வியானது கடந்த ஏழு நாட்களில், வார நாட்களில் உட்காருவதற்காக நீங்கள் செலவுபுரிந்த நேரத்தை பற்றியதாகும்.

இவை உட்பட, அலுவலகத்தில், வீட்டில், குறிப்பிட்ட வேலை செய்யும்போது மற்றும் வேலையில்லா நேரம் ஆகும்.

மேலும், ஒரு டேபிள் பக்கத்தில் உட்காருதல், நண்பர்களை சந்தித்தல், படித்தல் (அ) தொலைக்காட்சி பாக்க உட்காருதல் (அ) படித்தல் ஆகியவற்றின் நேரம் ஆகும்.

50. கடந்த ஏழு நாட்களில், வார நாட்களில், வார நாட்களில், உட்கார்வதற்காக நீங்கள் செலவிட்ட நேரம் எவ்வளவு ஆகும்?

_____ நேரம் / ஒரு நாளில் _____ மணித்துளி / ஒரு நாளில் தெரியவில்லை / உறுதியாக தெரியவில்லை.

51. எடை _____ Kg,

52. உயரம் _____ cm

53. BMI _____ அதிக எடை, உடல் பருமன், சராசரி எடை, குறைந்த எடை

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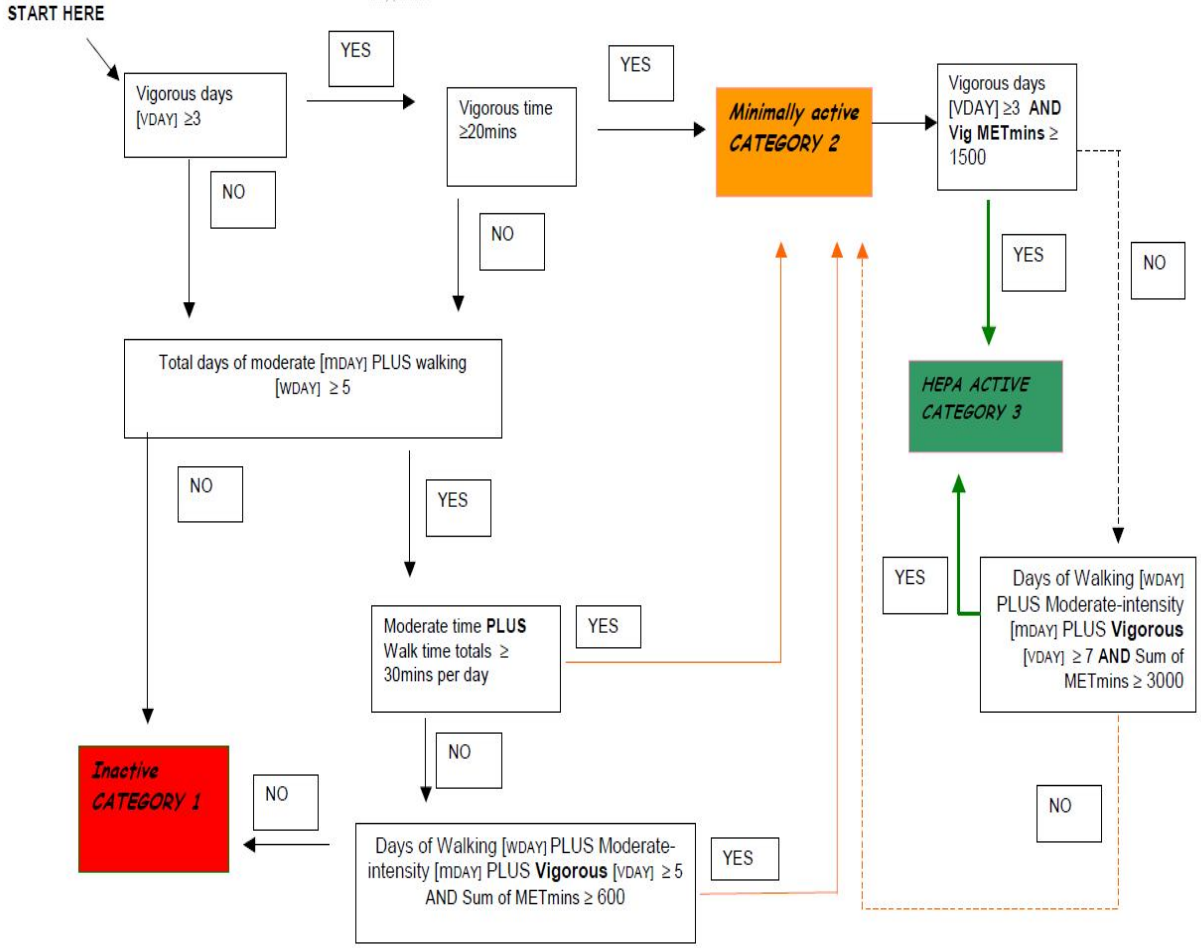

1

APPENDIX 2: Flow chart algorithm for the analysis of IPAQ short form